THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station — Beltsville, Maryland
Volume 31 — November 15, 1947 — Number 11

IN THIS ISSUE

D. C. Neal gives details concerning the recent discovery of Phymatotrichum root rot in Louisiana, page 416.

A disease of cultivated mushrooms that has become increasingly severe in southern Pennsylvania is identified by T. F. Manns as probably the same as the vert-de-gris disease reported from France, page 417.

Blue mold appeared as a field disease in a tobacco-growing section of southern Wisconsin, according to James Johnson, page 419.

Philip J. Leyendecker reports an epiphytotic of Phytophthora blight of chile pepper in southern New Mexico this year, page 421.

Some confusion in ideas regarding temperature relationships of the cucurbit downy mildew fungus is pointed out by A. G. Plakidas, page 422.

Progress reports on late blight, page 425.

W. D. Valleau and E. M. Johnson send the 1947 summary of tobacco disease occurrence in Kentucky, page 427.

A correction, page 431.

Bean diseases in some of the Mountain States in 1947 are reported by W. J. Zaumeyer and H. Rex Thomas, page 432.

Results of a survey reported by D. E. Ellis, page 443, show that the internal cork virus disease is generally distributed in major sweetpotato producing areas of North Carolina, although mostly at a low level of infection.

Observations on the status of eelgrass recovery in Massachusetts shore areas are reported by Ralph W. Dexter, page 448.

Check list revision, by Freeman Weiss, page 450.

September weather, page 466.

DISCOVERY OF PHYMATOTRICHUM ROOT IN LOUISIANA

D. C. Neal

On August 12, Dr. M. B. Sturgis found cotton plants affected with root rot in a field on the east side of the Red River about three or four miles north of Bossier City in Bossier Parish on Highway 10. This is the first time Phymatotrichum omnivorum had been found in Louisiana.

From August 26-28, with the Parish Agents of Caddo and Bossier Parishes, I made a rather extensive survey for evidence of the disease. We found one other infested field, near Dixie, in Caddo Parish, on the west side of the Red River on the Sentell Plantation about 18 miles north of Shreveport and about 30 miles from the Arkansas line. As nearly as could be estimated approximately 30 acres of land is infested on the farm near Bossier City and 3 1/2 or 4 acres in the field near Dixie.

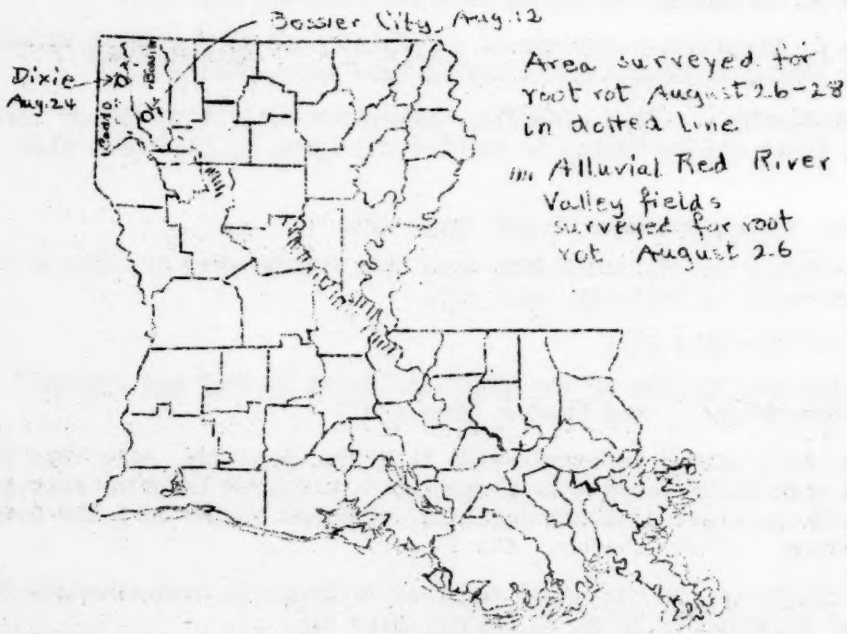
Bossier City, Aug. 12
Dixie
Aug. 24
Area surveyed for root rot August 26-28 in dotted line
Alluvial Red River Valley fields surveyed for root rot August 26

Figure 1. Location of Phymatotrichum root rot in Louisiana

From what we could learn from the present owners of these properties, the root rot has affected cotton and other crops on their farms for many years. Considering the acreage involved, the damage is rather severe at each locality. In addition to cotton, the disease was also found attacking sweetpotatoes at Dixie and on carrots, beans, and turnips at Bossier City.

These are the only infested areas that could definitely be located. Mr. Neal Dry, Parish Agent at Shreveport, surveyed Caddo Parish north from Dixie and reported no further evidence of the disease. No root rot was found in the extreme southern portions of Bossier or Caddo Parishes or in any of the other Red River alluvial soil along Highway 71 from Lebeau, Bunkie, Chenneyville, Alexandria, Coushatta, and Caspiana, to Shreveport. (Figure 1).

Owners of both farms where the disease was found were cautioned against the sale of infected truck crops to avoid possible spread of the disease to new localities, and advised to retire the present infested acreage from cotton and other susceptible crops and to plant it in non-susceptible grain crops.

U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
DIVISION OF COTTON AND OTHER FIBER CROPS AND DISEASES,
UNIVERSITY STATION, BATON ROUGE, LOUISIANA

THE VERT-DE-GRIS DISEASE OF THE CULTIVATED MUSHROOM OCCURRING IN THE UNITED STATES

T. F. Manns

For the past three years or more the Grocery Store Products Co. of West Chester, Pennsylvania, has been subject to increasingly severe losses from a diseased condition of the mushroom beds caused by a fungus which in severe cases forms a mat just beneath the casing soil. When infested soil is used in the compost, spots of the disease may be found throughout the compost.

The causal organism has been isolated and in the writer's opinion the diseased condition is identical with a disease of mushroom beds and spawn described by Costantin and Matruchot in France in 1894[1].

[1] Costantin, J. and Matruchot, L. Recherches sûr le vert de gris, le platre et le chanci, maladais du blanc de champignon. Rev. Gen. Bot. 6: 289-300 Illus. 1894

The fungus here is tentatively identified as Myceliophthora lutea Cost. There are two forms of the fungus in this district, one form with smooth chlamydospores as described by Costantin et al., and another with chlamydospores having ebullitions or spines on the margins.

From conversation with Dr. J. W. Sinden and Dr. E. B. Lambert, it was learned that the disease was causing severe damage in mushroom plants at Barberton, Ohio, and at South Lebanon, Ohio, ten years ago. The growers have not been able to eliminate the disease entirely from their beds, but have greatly reduced the severity of the infestation by sanitary measures and by increasing the temperature in their houses during pasteurization.

The disease was found in several plants in the Chester County area in Pennsylvania and Maryland this spring and it is believed to be more prevalent in the houses of Eastern growers than they realize.

In a survey of mid-western mushroom plants this season, Dr. Lambert found the disease in the following locations: Barberton, South Lebanon, Lima, and Columbus Grove, Ohio, and Des Plaines, Illinois.

In severe cases the losses to growers may be as high as 50 to 75 percent of a crop. Because of the serious economic aspect of the situation the Grocery Store Products Co. has engaged the writer to make an extensive study of the disease to determine its cause, transmission, and control.

Preliminary studies show the disease in its severe form ("mat disease") is primarily a heavy infestation of the casing soil, and not of the compost. Under no consideration should such soil be used in supplementing composts, as "top heat" of 140°F. in the bed does not completely control the disease in the compost. Also a steam heat of soil in autoclave for three hours at 140° F. does not control the disease. Further work is in progress to determine the killing point in the soil and in the compost.

The writer has introduced the method of injecting a formaldehyde solution into high pressure steam boilers at 75 to 100 lbs., and then forcing this steam through the soil by properly perforated pipes. The formaldehyde in boilers is also being used to disinfect houses more thoroughly. This method for sterilizing soil and houses under "sick" conditions is showing much promise.

GROCERY STORE PRODUCTS CO., MUSHROOM DIVISION
WEST CHESTER, PENNSYLVANIA

TOBACCO BLUE MOLD IN WISCONSIN

James Johnson

It is fortunate for the growers in Wisconsin that their tobacco crops have escaped the blue-mold disease (downy mildew) until 1947. This disease has previously been reported in all major tobacco-growing areas in the United States and Canada since its first known occurrence in the Florida-Georgia shade-growing section in 1921. The writer had no opportunity to see the disease at that time, when it appeared likely to menace the field crop, but the subsequent behavior of blue mold there and in other areas has shown it to be largely a seedbed disease.

On July 19, 1947, our attention was called to a field disease on half-grown tobacco near the northern border of Dane County, Wisconsin. As many as 70 chlorotic and necrotic lesions up to one inch in diameter had developed on leaves up to 14 inches in length. Six to eight leaves on the plants were affected. A few lesions were producing sporophores which, on microscopic examination, were identified as those of Peronospora tabacina Adam.

A field survey of the surrounding district located the disease on 27 farms, although it appeared menacing in the field on only two other farms. In many instances the disease was so slight that it had not been noted by the growers. The center of heaviest infection proved to be the Township of Windsor, Dane County, about 12 to 18 miles northeast of Madison. Some infection, however, was soon found in four surrounding townships, including the Town of Hampden, Columbia County. One field infection was found near the southern border of the Town of Cottage Grove, a distance of about 20 miles from the infection farthest north. The affected area lies chiefly on the northern border of the southern tobacco growing section of the State and not in the more concentrated areas of tobacco culture. No infection as yet (July 30) has been found in the tobacco growing sections south of Madison or in the northern growing area in Vernon County. The affected section apparently corresponded to a region in which precipitation occurred July 12-13, associated with very humid weather, followed by relatively warm days and cool nights.

Seedbed symptoms had undoubtedly been noticed by one grower soon after his transplanting was completed late in June. Since the transplanting season was about three weeks later than normal, because of the cool, wet spring, it was clear that the spread of the disease occurred too late to cause appreciable seedbed damage. During the survey, several seedbeds were found showing traces of infection and heavy localized infection long after transplanting had been completed.

The symptoms on these old and often stunted seedbed plants often were not typical of blue mold and might be mistaken for some other known or unknown disease. Now that we have seen these atypical symptoms in the seedbeds late in the season, we are not certain that they have not escaped proper identification in previous years in this State.

Although blue mold was first found on Wisconsin farms during the present season, an interesting occurrence of this disease developed at the station greenhouses on November 9, 1945. During experiments on the relationship of water-congestion to predisposition to the tobacco wildfire disease, several flats of seedlings were exposed to outdoor conditions for a few days prior to this date. The flats were then transferred to a moist chamber where they remained for about 24 hours before being set on the greenhouse bench. These seedlings developed a disease heretofore unobserved in Wisconsin which, on examination, proved to be blue mold. The seedlings evidently picked up the spores while exposed outdoors. Whether the spores came from long distances outside the State or from some unknown source of infection within the State remains a matter of speculation. These flats were all destroyed, and continued efforts were made toward eradication of the disease in the greenhouse, but it appeared occasionally during the remainder of the fall and winter months. Careful roguing, fumigation with paradichlorbenzene, and continuous greenhouse air temperatures of 80° F. or above in one house were not sufficient to prevent occasional sporadic infection. However, the disease was apparently eradicated from the greenhouse during the spring and did not occur in any Wisconsin seedbeds as far as could be determined in 1946 or in the greenhouse in 1946-47.

Whether or not this disease will prove serious to tobacco, in either seedbeds or in the field in Wisconsin during a normal season, remains to be seen. The weather and other conditions may be sufficiently different to vary the behavior of the disease and to cause more extensive field infections, such as occur occasionally in Australia where the disease was described as early as 1890. On the other hand, its appearance late in the season suggests that the seedbeds may largely escape the disease. Much will depend upon the possible overwintering of the parasite in the oospore stage.

WISCONSIN AGRICULTURAL EXPERIMENT STATION AND
THE UNITED STATES DEPARTMENT OF AGRICULTURE

AN EPIPHYTOTIC OF PEPPER BLIGHT CAUSED BY PHYTOPHTHORA CAPSICI IN SOUTHERN NEW MEXICO

Philip J. Leyendecker

Leonian[1] in 1918 reported a Phytophthora stem and fruit blight of chile[2] pepper in southern New Mexico. He described the pathogen as new and assigned to it the specific epithet capsici. Since 1918, Phytophthora blight has appeared in southern New Mexico at various times but it has never been considered a major pathological problem by the pepper growers in the State.

During the month of August, 1947, the disease reached epiphytotic proportions in the chile pepper fields of southern New Mexico. Disease counts revealed that approximately 50 to 60 percent of the green fruit became infected during the ten-day epiphytotic. The infected pods became dry and mummified four or five days after the pathogen gained entrance. Mummified and healthy pods are shown in figures 1 and 3, respectively. Figure 2 shows a chile pepper plant killed by girdling of the main stem by Phytophthora. The fungus, in many cases, moved from the mummified pods into the rapidly growing branches. Once in the vegetative part of the plant, the organism girdled the branches and caused immediate wilting and subsequent blighting of the foliage. The main stems, in 15 to 20 percent of the diseased plants, were girdled at the ground level and died. In one field visited, 85 percent of the pepper plants had been so killed. Field observations reveal that the three points of entry are (1) main stem, at ground level, (2) green pods, (3) young succulent stem tips.

In highly productive fields, where the vigorous plants formed an overhanging canopy, the incidence of pod infection was very high and the pathogen remained active over a longer period of time. Following the ten-day period of high relative humidity, humidity became more normal and the disease was temporarily checked, although in highly infected fields stem and foliage blight is cohtinuing.

Precipitation records for the period of the epiphytotic are shown in the accompanying tabulation. It will be noted that some rain fell during six of the ten 24-hour periods listed. For comparison, the highest ten-

---

[1] Leonian, L. H. Stem and fruit blight of peppers caused by Phytophthora capsici sp. nov. Phytopathology 12: 401-408 1922.

[2] The word chile is the Spanish name used for the "hot" type of red pepper (Capsicum annum L.), as distinguished from the more mild types such as Chinese Giant, Ruby King, etc.

Precipitation during Ten-day Period of Epiphytotic		Comparative August Records for Past Four Years			
			Totals for August	High Ten Day Period	Yearly totals
August 15	0.07 inches	1947	2.38	2.17	
16	0.42 inches	1946	2.16	.96	7.14
17		1945	1.92	1.74	5.77
18	1.06 inches	1944	2.65	.94	9.77
19		1943	.94	.54	7.55
20	0.06 inches	Averages	2.01	1.04	7.56
21	0.18 inches				
22					
23	0.28 inches				
24					
Total	2.17 inches				

day period for August and totals for the month, as well as the yearly rainfall averages for the last four years are included. It is believed that these figures reveal the extremely dry conditions that exist in the region, and that a total precipitation of 2.17 inches during the ten-day period is to be considered very unusual.

DEPARTMENT OF BIOLOGY
NEW MEXICO AGRICULTURAL EXPERIMENT STATION
STATE COLLEGE

COMMENTS ON THE TEMPERATURE RELATIONSHIP OF THE CUCURBIT DOWNY MILDEW FUNGUS

A. G. Plakidas

Recently the writer had an occasion to review the literature on downy mildew of cucurbits, when he came across certain statements in the Plant Disease Reporter[1] bearing on the temperature relations of the causal fungus, Peronoplasmopara [Pseudoperonospora] cubensis, which he does not believe to be warranted. These statements, a few of which are quoted below, give the reader the impression that infection by the downy mildew fungus is favored by cool weather, and this is contrary to the known behavior of this pathogen in the field.

1 Nusbaum, C. T. The seasonal spread and development of cucurbit downy mildew in the Atlantic Coastal States. Plant Dis. Reptr. 28(3): 82-83. 1944; 29(5): 141-143. 1945.

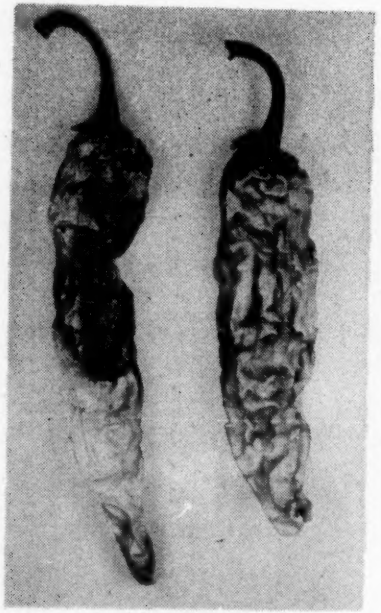

Figure 1.
Mummified chile pepper pods removed from a diseased plant.

Figure 2.
Chile pepper plant killed by Phytophthora capsici girdling the main stem. Note large number of mummified pods.

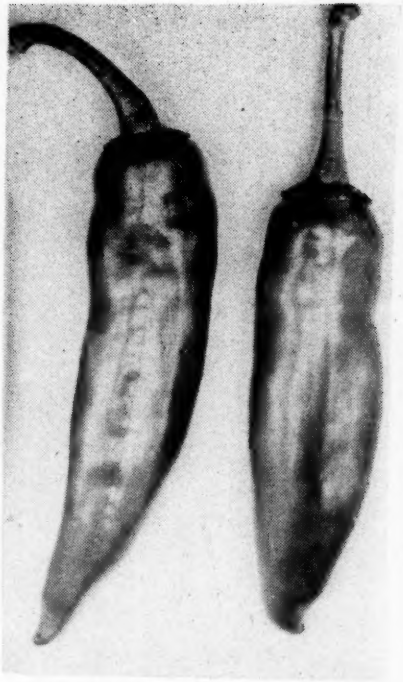

Figure 3.
Healthy green chile pods.

The following quotations will serve to illustrate the point (italics are the writer's).

A. From Plant Disease Reporter 28(3): 82-85. 1944

1. Virginia. "....It was first found on July 26. Early July was hot and humid, but a cool spell occurred from the 19th to the 23rd, when the initial infections probably took place..."

2. Massachusetts. "....In the southeastern part of the state it was too warm and dry during July and early August for the disease to develop...If inoculum was present in the southeastern part, either overwintered or wind-borne, the establishment of the disease there awaited the onset of cool, damp conditions after mid-August."

B. From Plant Disease Reporter 29(5): 141-143. 1945

1. Georgia. "Downy mildew was not observed in the Tifton section. Unseasonably high temperatures and drouth conditions occurred throughout May and June...."

2. South Carolina (Blackville). "Conditions were very unfavorable from May 27 to June 3, because there were no rains or dews and temperatures were very high during that period."

"A severe drought with high temperatures occurred in the Blackville area from June 12 to 20 and downy mildew failed to develop until the advent of cooler, moist weather in late June."

3. North Carolina. "Cool, moist weather favored sporulation and spread of downy mildew in early July."

4. Delaware. "The weather during the entire season was hot and dry and there was little opportunity for establishment of the disease."

5. Pennsylvania. "The growing season for cucurbits at Doylestown was hot and dry. Downy mildew was not observed."

6. Massachusetts. "No downy mildew was found on cucurbits either in....or the Connecticut River Valley during July and August surveys. However, potato late blight was found in the Connecticut River Valley early in August. This suggests that conditions might have been favorable and that downy mildew was not established because of the absence of inoculum."

The inference that the same climatic factors that favor potato late blight will also favor cucurbit downy mildew is hardly tenable.

It will be noted that in practically every one of the reports quoted above, the factors of temperature and moisture are used in conjunction: "hot and dry", "cool and moist", "drought and high temperature conditions". But, although these factors are related in that falling temperature generally accompanies rains, they are not necessarily of equal importance in this case. It is the "dry" component of the "hot and dry" combination that is important. Moisture is very important, for both sporulation and infection, but high temperature, within limits, is not. Van Halten[2] has shown that sporulation occurs within a rather wide range, 45° to 86° F., and that the incubation period (from infection to sporulation) is 12 to 13 days in cool and only 4 days in warm weather.

It is true, of course, that many downy mildews (those of tobacco, spinach, lettuce, and onion, for example) are favored by cool weather, but the cucurbit mildew appears to be a notable exception. In Louisiana, the cucurbit downy mildew is active throughout the summer, from the latter part of May to the end of October, and even the most enthusiastic admirer of Louisiana climate would not venture the claim that Louisiana summers are cool. The fall crop of cucumbers in Louisiana is planted in early August, and the plants are attacked almost as soon as they emerge. This year, in particular, mildew was widespread in the Hammond area during the last week of August and the first week in September, and this happened to be one of the hottest periods of the summer with maximum temperatures ranging from 96° to 101° F. and the minimum between 74° and 77° F.

Early investigators apparently appreciated the fact that the cucurbit downy mildew was not inhibited by high temperatures. Stewart[3], for example, states:

> "If the weather is cool, the yellow spots spread less rapidly," and further:
>
> "The downy mildew fungus likes hot weather and moderate rainfall. The time of worst attack is generally in August. During the first half of last August, there was a period of ten days of excessively hot weather. The disease spread with such alarming rapidity that by August 20 the majority of cucumber

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[2] Van Halten, Frank. Spraying cantaloupes for the control of downy mildew and other diseases. Ga. Agr. Exp. Sta. Bull. 175. 1933

[3] Stewart, F. C. The downy mildew of cucumbers, what is it and how to prevent it. New York Agr. Exp. Sta. Ann. Rept. 1897

fields were ruined."

The Louisiana farmer would be happy if the cucumber downy mildew fungus were a cool weather organism. It would save him the expense and bother of 15 to 20 spray or dust applications during the hottest part of the year.

The writer hopes that these remarks will be taken in the spirit in which they are given --- not as criticism for the sake of criticizing, but merely as a helpful suggestion. The value of the epidemiology survey is dependent upon the accuracy of the observations made. The survey is of little value if the conclusions drawn from it are based on faulty premises.

DEPARTMENT OF PLANT PATHOLOGY
LOUISIANA AGRICULTURAL EXPERIMENT STATION
UNIVERSITY STATION, BATON ROUGE

PROGRESS REPORT ON LATE BLIGHT

LATE BLIGHT IN POTATOES IN PRINCE EDWARD ISLAND: Recent showers and humid weather have provided ideal conditions for late blight. Spores were produced in great numbers during the past four days. All varieties not already mature, require an immediate application of spray. Unless the weather is very wet, no further applications will be necessary. Killing the vines by a chemical should be done not later than October 1 (L. C. Callbeck - Sept. 17). --Reports transmitted by I. L. Conners, Canada Department of Agriculture, Central Experimental Farm, Ottawa

LATE BLIGHT IN TOMATOES IN ONTARIO: Late blight was found by Dr. C. D. McKeen September 16 in a field of tomatoes in the centre of a very important tomato-growing area in Essex County not far from Harrow (A. A. Hildebrand). Late blight has been found in 6 fields in the Niagara Peninsula (G. H. Berkeley, Sept. 12). Late blight is prevalent in the Forest district of Lambton County on September 11; according to growers it had been causing damage for over a week (J. D. MacLachlan). Tomato fruits affected by late blight were brought in for positive diagnosis from a farm in the Ottawa district; it was reported that all fruits were affected. A trace of late blight was also reported on the foliage of tomatoes in the Division of Horticulture plots (H. N. Racicot, Sept. 16). -- Reports transmitted by I. L. Conners, Canada Department of Agriculture, Central Experimental Farm, Ottawa

TOMATO LATE BLIGHT IN MASSACHUSETTS: Following the one unconfirmed report of late blight on tomatoes (July 23, Worcester County) none has been reported in the State until recently. On September 24 I observed light to moderate infection of fruits and foliage in a commercial field in Essex County, and Dr. W. M. Banfield found the disease on home garden tomatoes in Amherst on the same day. In each location, the disease apparently had been noticeable for no more than 7 to 10 days, and its development has occurred only since the advent of cool damp weather.

In a previous report, the absence of late blight on tomatoes was attributed to the unusually warm, dry weather during August. A summary of weather conditions for August in Amherst has just now been received:

	August 1947	Normal
Precipitation (inches)	1.69	4.08
Rainy days	6	11
Mean max. temp.	84.5	---
Mean min. temp.	61.5	---
Mean daily temp.	73.0	68.6
Mean rel. humid. (%)	80.4	70.2

O. C. Boyd, Massachusetts State College, Amherst. Sept. 26.

LATE BLIGHT ON FALL POTATOES IN THE VIRGINIA TIDEWATER AREA: Late blight was found on fall potatoes today. Temperatures have been low since September 23 and although the rainfall has been only moderate, there have been frequent heavy dews.

Late blight is normal at this time of year. It usually develops during the first two weeks in October, but in 1946 it developed in September.

On September 1 the growers were advised to begin spraying or dusting the fall potatoes about September 15. -- Harold T. Cook, Virginia Truck Experiment Station, Norfolk. Oct. 15.

TOMATO LATE BLIGHT AND OTHER DISEASES IN OHIO: The late blight fungus, Phytophthora infestans, has been reported active in four more counties in Ohio the past two weeks. On September 18 it was reported in Lucas County; and in Wood, Erie and Hardin Counties September 24. It has spread considerably in Wayne County since the early report. However, tomatoes have been extremely late in the canning areas and it is doubtful whether any significant loss has occurred as a result of late blight. We have had a number of frosts the past week, which have been far more serious in regard to the tomato crop than the late blight disease.

In a survey through the cannery tomato crop area during the week of

September 15, early blight [Alternaria solani] and Septoria leaf spot [S. lycopersici] were developing rapidly and causing considerable damage through defoliation. -- T. H. King, Ohio State University, Columbus. Oct. 2.

LATE BLIGHT IN MICHIGAN: Late blight reported in two tomato fields in Oakland County September 15 by Dr. Arthur Frank. Extent of infection not reported. Late blight also reported in Lenawee and Monroe Counties. Report confirmed by Dr. John Vaughn, Extension Pathologist in Monroe County, where one field showed 50 percent infection on both foliage and fruit, other fields show trace of infection, and some show none. Continued favorable weather conditions could produce epidemic but temperatures appear to be rising. -- M. C. Strong, Michigan State College. Telegram, Sept. 18

POTATO LATE BLIGHT AND EARLY BLIGHT IN WISCONSIN: The potato late blight fungus, Phytophthora infestans, was found sporulating on late potato vines in Walworth County September 19. It had apparently been there three or four days following the period of showers for about three days ending September 13. In no case was it serious and it was effectively checked by the subsequent dry weather. Potato harvest is in full swing and little loss is expected. Several different sprays have been used.

In the northern part of the State several sizz burners are being used to kill green potato vines on upland soil. On marsh soil some Dowacide 66 and aero-cyanamid is being used.

Potato early blight, Alternaria solani, has been found in many fields. Apparently it has not done much damage as it did not develop until the vines were nearly mature. The customary copper sprays have done very little to check early blight. The new Parzate spray has done a much better job. -- R. E. Vaughan, University of Wisconsin, Madison. Sept. 20.

TOBACCO DISEASES IN KENTUCKY - 1947

W. D. Valleau and E. M. Johnson

The weather during the spring and most of the summer was characterized by frequent showers. The spring and early summer were exceptionally cool.

Blue Mold [Peronospora tabacina] Blue mold was first reported on May 8 in Spencer County, and during the next week from many other counties. While the first report was of disease in a new bed, most

of the first reports in counties were in second-year beds, indicating carry-over from the previous year. There was no evidence of blow-in from the South or Southeast. By June 1 the disease had caused little injury. There were no extended damp periods, but heavy showers which probably washed spores from the air were followed by hot or dry cold periods. All available Fermate was purchased, but little of it was used.

2,4-D Injury in Plant Beds. Several reports and specimens of "mullein leaf" tobacco were received. Beds had been sprayed with Fermate with a sprayer used the previous summer for 2,4-D. Affected plants set in the greenhouse finally recovered and made normal growth. A grower who had had this trouble in 1946 and set plants in the field did not hesitate to set out affected plants in 1947.

Wildfire and Angular Leaf Spot [Pseudomonas tabacum, P. angulata] Because of repeated showers during the plant bed season, wildfire and angular leaf spot were general in plant beds not drenched with Bordeaux mixture. Many growers who had been in the habit of using Bordeaux neglected to apply it, either because of the wet season or because they planned on using Fermate and were confused as to the merits of the two materials. Bordeaux usually gave perfect control of both bacterial diseases in the plant bed except where water washed over the bed and introduced the bacteria in this way. Wildfire was prevalent and destructive in fields set from infected beds. Usually fields set from treated beds were free from infection or, if it occurred, the infected areas were isolated groups of plants. This was a year that clearly demonstrated the value of the drench method of control in spite of the fact that it was not 100 percent effective in preventing field infection.

Blackleg and Hollow Stalk (Bacillus [Erwinia] aroideae. Blackleg was quite common in plant beds, where it caused decay and blackening of the bases of the stems of plants just ready to transplant. Probably because of wet weather after transplanting, poor stands were obtained from beds affected with blackleg, and much resetting was required. While we have no experimental evidence of the value of Bordeaux in control of blackleg, we have not observed the disease in beds drenched with Bordeaux mixture, but it was common in untreated beds.

Hollow stalk was common this year. A few affected plants could be found in nearly any field after topping, and some growers reported over 50 percent of the plants with hollow stalk and the lower leaves falling off. Hollow stalk was associated with frequent rains and wounds left by breaking out tough tops and suckers; this usually left a fringe of woody tissue around the pith capable of holding moisture. It is probable that topping with a knife might have greatly

reduced hollow stalk, as it would leave a sloping, smooth cut that would dry quickly.

Black Root Rot [Thielaviopsis basicola] was very severe in susceptible varieties because of the cool, wet season following setting, and this proved to be a test year for the resistant varieties. Ky 33 developed rather severe injury. In the past it has been considered resistant. Ky 16 and Ky 41A were delayed somewhat in maturity in heavily infested soils as compared with the more resistant varieties such as Ky 22, Ky 56, and a group of other hybrids deriving resistance from T.I.87 and similar collections. Ky 25, a resistant variety like Golden Burley in plant type, proved too susceptible to be satisfactory. The sale of certified root-rot-resistant seed has increased each year so that now probably 85 percent of the Burley crop is made up of resistant varieties.

Clubroot (wound-tumor-like virus) was found in Boone, Grant, Owen, and Gallatin Counties, where it seems to cause considerable dwarfing of plants. A specimen was also received from Vevay, Indiana, which is in the same general area but north of the Ohio River. No above-ground symptoms could be seen on any of the plants examined other than slow growth. Three outbreaks were investigated in which the plants started to grow normally following transplanting, then appeared to become smaller because of loss of the larger leaves and finally made a fair amount of growth. In each case there was no relation between the distribution of infected plants and proximity to unplowed ground. The affected areas might be in the middle of a field and surrounded by plants that were either free from infection, gave evidence of having been inoculated late, or there were occasional plants that appeared to have been inoculated early. In each case a sod had been plowed in the spring and in each case a nearby planting that was in garden or corn in 1946 was free or had only scattering club root plants. If the club-root virus is closely related to or is identical with Black's wound tumor virus, then it is transmitted by leafhoppers. A possible explanation of the abundance of the disease after sod is that the over-wintering leaf hoppers left the vegetation as it was turned under and survived on the surface of the plowed ground until tobacco was set when the virus was transmitted to it. In digging plants from the heavily infested areas, it was evident that infection had occurred soon after setting because the earliest roots were enlarged while later roots put out higher on the buried stems were often nearly free from tumors. Occasional affected plants found in fields where infection was rare usually had scattered tumors on the roots giving a different appearance from plants affected early. So far there is little or no evidence that the hoppers migrate into tobacco fields from nearby pastures and cause infection.

Black Shank [Phytophthora parasitica var. nicotianae] was reported from Spencer, Mercer, Washington, Bath, and Bourbon Counties and from across the Ohio River at Markland, Indiana. Loss was minor in all cases, but the outbreaks indicate that the organism is fairly well established, particularly along streams.

Brown Root Rot [undet.]. Root trouble other than black root rot resulted in poor growth of tobacco over the State. Where good specimens could be obtained the trouble was usually found to be associated with meadow nematodes. However, where surveys had been made of the nematode population in bluegrass pastures before plowing for tobacco there was not always an association between the presence of what appeared to be large numbers of meadow nematodes in bluegrass roots and poor growth in tobacco. In an old fertile sod, for example, where nematodes occurred in considerable numbers in a small area, tobacco grew as well as where no nematodes were found. Perhaps good physical conditions of the soil and high fertility overcome the effects of nematode injury to some extent.

Soil fumigation with DD on land in which meadow nematodes were known to be abundant had no appreciable effect on the growth of corn or tobacco or on nematode counts in roots collected, as compared with untreated plots. A slight difference was noted by Mr. Bortner at harvest time in the middle of September in that the tobacco on the treated plots seemed to mature slightly more quickly than that on the untreated. The treated plots were sod turned under. The sod is probably penetrated very slowly by the gas.

Ring Spot (virus) was unusually prevalent over the State.

Veinbanding (virus) was unusually prevalent, probably because of the heavy infestation of aphids. Potatoes were usually found growing nearby.

Fusarium Wilt [F. oxysporum f. nicotianae] was about as prevalent as usual. Several new varieties, crosses of Ky 34 with other varieties, were tested with farmers in order to find a Fusarium-resistant variety that would stand up in rain and wind storms better than Ky 33 and Ky 34. It seems now that one or more of the new strains will stand up well under adverse conditions. All of the strains tested are resistant to Fusarium wilt, black root rot, and mosaic (NN). Some of the new strains, in common with Ky 34, appear to be very susceptible to the veinbanding virus, as they develop a severe leaf necrosis following infection, whereas all other varieties of Burley merely develop a mild chlorosis. This characteristic will eliminate all of the sensitive strains of Fusarium-resistant Burley.

Manganese Toxicity has been noticed in a few fields where vetch

and a small grain were turned under and tobacco set. The trouble usually developed after the plants were well established and later in the season tended to disappear. In one field where this trouble had appeared two years in succession, lime was added and the next crop showed none of the trouble. The plants take on a peculiar greyish-green color with small necrotic spots in the small vein islets.

Root Knot Nematodes [Heterodera marioni] were found in specimens of tobacco, tomatoes, and melons following a corn-grass rotation in Greenup County, and were found in tobacco roots from Whitley County where the previous rotation was not known.

Frogeye (Cercospora sp.) was unusually prevalent in ripening tobacco. In some instances the affected leaves dropped off the plant at cutting time, thus greatly increasing the cost of harvest. The disease is extremely rare in plant beds. Infection appears to develop after the plants are set in the field, perhaps from Cercosporas on native vegetation, as several of the so-called species on native plants produce typical frogeye spots on tobacco in the greenhouse.

KENTUCKY AGRICULTURAL EXPERIMENT STATION
LEXINGTON

A CORRECTION

In my article entitled "Reaction to rust, under Mississippi conditions, of certain lines and varieties of pole snap beans" which appeared in the Plant Disease Reporter, Volume 31, Number 10, pages 378-383, 1947, the following corrections should be made. Wherever the year "1945" appears it should read "1944", and wherever the year "1946" appears it should read "1945". -- H. H. Foster, Mississippi Agricultural Experiment Station, State College.

BEAN DISEASES IN SOME OF THE MOUNTAIN STATES IN 1947

W. J. Zaumeyer and H. Rex Thomas

This survey was conducted in Colorado, Wyoming, Montana, Utah, Idaho, Washington, and Oregon, during the month of August 1947. Since time did not permit a systematic survey of most of the acreage in a locality, only representative fields of both garden and dry bean varieties were examined in each area. It is the purpose here to record the presence or absence of the several diseases, but not to give estimates of the losses caused by them.

Colorado

Weld County

Bacterial Blights (Xanthomonas phaseoli and Pseudomonas phaseolicola). Each of these diseases was of minor importance, considering the large acreage of beans planted in the county. A number of fields of snap beans had a high percentage of infection. Severe infection was generally correlated with local rain or hail storms. In most Pinto bean fields, only a trace of blight believed to be due to Xanthomonas phaseoli was observed. As the symptoms produced by X. phaseoli and X. phaseoli var. fuscans are similar, the only means of distinguishing between the causal agents is by isolation, which was not done. In 1946, the latter organism was found to be responsible for much of the reported infection.

Bacterial Wilt (Corynebacterium flaccumfaciens) was observed in several fields of Pinto and snap bean varieties but it was not widespread.

Rust (Uromyces phaseoli var. typica). Only a trace of bean rust was noted.

White Mold (Sclerotinia sclerotiorum) and Anthracnose (Colletotrichum lindemuthianum) were not observed.

Bean Wilt (Pythium butleri). As in former years, traces of this disease were found in a few fields, particularly on the Refugee varieties.

Virus Diseases. Common bean mosaic (bean virus 1) was of minor consequence although in a few fields it was widespread. Within the past two years, considerable Pinto bean seed from crops that had been rogued for mosaic the previous year has been planted in northeastern Colorado. This has accounted for considerable reduction in the amount

of the disease. During the past season, a small acreage of the new mosaic-resistant Idaho Pintos was grown for the first time. The use of these varieties will further reduce the amount of common bean mosaic, which has been very widespread in Pinto beans in former years.

Greasy pod was found in a number of fields of snap beans but was not widespread in any. On Pinto beans this virus produces symptoms very similar to those of common bean mosaic, which makes it impossible to differentiate the two viruses by inspection alone.

Yellow bean mosaic (bean virus 2) was uncommon.

Physiological Diseases. The condition reported for several years as possibly being due to an excessive salt concentration (PDR 29:145 and 31:60) was again noted but was not causing any serious crop damage.

Mesa County

Bacterial Blights. Not observed.

Rust and Anthracnose. Not observed.

Root Rots (Fusarium solani f. phaseoli and Rhizoctonia sp.) These diseases were observed but in only two fields was any appreciable loss in stand noted.

Virus Diseases. Red node was very prevalent in an experimental planting of dry and garden beans growing adjacent to virus-infected sweetclover plants. Some bean plants showed typical yellow bean mosaic mottling with no necrosis, and other plants had reddish nodes and necrotic streaking of the stem with no yellowing or mottling of the foliage.

Wyoming

Big Horn, Park, and Fremont Counties

Bacterial Blights. In Park and Big Horn Counties, only traces of common blight were found in garden and dry bean varieties. In each instance the land had been in beans the previous year. A trace of bacterial wilt was found in several fields of Pinto beans in Big Horn County. In Fremont County, bacterial wilt was very serious. Infected plants were found in many of the fields of Pintos and Great Northerns. In the most seriously affected planting, approximately 60 percent of the plants were dead or very stunted. This particular field had been subjected to heavy rains early in the season. The plants in one section of the field planted later had not germinated at the time of the

rain, and in this area only about 10 percent of the plants were infected as compared with the 60 percent infection for the earlier planting. The seed used to plant the field had been obtained from Idaho but the land had been planted to beans the previous year so the source of infection could not be definitely established. However, traces of bacterial wilt were found in several other fields of Great Northerns not previously planted to beans and the seed was of southern Idaho origin.

Rust. Only a trace of rust was observed in Park and Big Horn Counties.

White Mold. In Park and Big Horn Counties white mold was observed in field beans but in most cases was serious only in those fields that were heavily irrigated and that had heavy vine growth in rows relatively close together.

Anthracnose. This disease was not observed.

Virus Diseases. Common bean mosaic was found in several fields of Pinto beans in all three counties but was of secondary importance.

Greasy pod was found on certain garden varieties in Park and Big Horn Counties but was not causing much reduction in yield.

Physiological Diseases. In Park County, the condition reported previously in Weld County, Colorado, as possibly being due to excessive salt concentration, was very prevalent in the field beans. Locally, this diseased condition had been referred to as "bronze leaf." Growers reported that this trouble was responsible for considerable reduction in yield.

Utah

Weber and Cache Counties

The only acreage observed in these counties was of the Blue Lake variety which was grown for canning. In all cases the plants were staked. The survey was made in the vicinities of Ogden, Hyrum, and Logan. Very little, if any, acreage in Utah is grown for seed purposes.

Viruses. Yellow bean mosaic was of extreme importance and was causing heavy losses in practically all of the fields grown in the above localities. The plants were stunted and the leaves mottled and malformed, but little necrosis was observed. Many of the pods were shiny, quite similar to those produced on plants infected with greasy

pod. Pod malformation was common. It was reported by the growers that the infection always started from the ends of the field adjacent to mosaic-infected sweetclover which grows wild throughout the area along most fence rows and ditch banks. The mosaic spread inward rapidly. Fields in these localities are generally quite small, usually 1 to 3 acres. About the second week in August, at the time the survey was made, most fields were practically 100 percent infected. In many cases only 2 to 3 tons per acre of snap beans were harvested, whereas a normal crop should yield from 10 to 12 tons per acre. An unusually high population of aphids was reported this year and it is believed that they were responsible for the widespread transmission of the virus from infected sweetclover growing along the edges of the fields and from earlier infected bean plants. The fact that the plants were staked and the fields relatively small made aphid migration easier than in large unstaked fields. In addition to causing severe crop loss, the quality of the pods was impaired, principally by distortion and malformation.

No other diseases were observed in these fields.

Montana

Yellowstone County

Bacterial Blight. Common blight was widespread and serious in a large percentage of Great Northern and Pinto bean fields both of local and Idaho seed origin. Most of the crops were damaged by hail during the season and several driving rains were reported for the area, thus accounting for much of the infection. In several instances, the disease was serious in fields that had not grown beans in 1946 and had been planted with Idaho-grown seed. Such fields were also at some distance from other infected fields. Soil-borne blight infection has been demonstrated in previous years in crops planted on land that had grown beans the year before. It is possible that a 2-year carry-over of the organism in the soil might have been the source of the infection noted above. As in Colorado, isolations from infected plants were not made, hence the relative distribution of *Xanthomonas phaseoli* and of *X. phaseoli* var. *fuscans* is not known.

Rust. As in 1946, only a trace of rust was noted.

Anthracnose. This disease was not observed.

Root Rots. In one field of Great Northern U.I. 15 root rot was very serious, causing at least a 35 percent reduction in stand. In the other fields inspected, it was of minor importance.

Virus Diseases. Common bean mosaic was of secondary importance

in commercial acreages since practically none of the susceptible varieties are grown in the area. In the experimental plots at the Huntley Station where susceptible varieties were grown, the disease was common.

Traces of yellow bean mosaic were found in most of the fields examined.

Physiological Diseases. The same condition reported for Colorado and Wyoming was noted in several fields of Great Northern but it was not widespread.

Idaho

Twin Falls, Jerome, Minidoka, and Canyon Counties

Bacterial Blight. As in 1946, a trace of halo blight was observed in several plantings of seed beans in the Twin Falls area.

Bacterial Wilt. A severe infection of Corynebacterium flaccumfaciens, and the first to be reported from Idaho, was noted in a large field of the Tendergreen variety causing a considerable reduction in yield. In one field a small amount was found and in two other fields traces were observed. The seed used for planting all of these fields was from the same lot and was of southern Idaho origin. It was reported that the seed stock in question had been grown in the Twin Falls area for the past eleven years. The plants in the field in which severe infection was noted had been slightly injured by hail, followed by a light rain. No hail had occurred in the fields where the infection was lighter. It is evident that much of the infection in the severely infected field was due to secondary spread of the organism as a result of the hail. It is assumed that the disease was present in this seed lot in 1946 but was overlooked.

It has been suspected that this organism was present in southern Idaho since for the past several years the disease has been found in small amounts in Wyoming in fields of Idaho-grown Great Northern seed which had been planted in ground that had not grown beans for several years. Bacterial wilt was also found in fields of garden beans both in this State and in Colorado that were planted with seed from Southern Idaho.

Although serious halo blight infection has been observed in several fields in southern Idaho within the past 5 years, the seed used in these plantings in all cases was of out-of-state origin. This is the first case in which the writers have noted severe bacterial infection in Idaho in fields planted with seed of local origin.

White Mold. This disease was causing considerable damage in several fields of dry beans. None was observed in the bush snap bean varieties.

Anthracnose and Rust. Neither of these diseases was observed.

Root Rots. These diseases were quite common, especially in fields where beans had been grown successively for several years.

Bean Wilt. Traces of this disease were found in several fields of the Refugee varieties.

Virus Diseases. Common bean mosaic was widespread in plantings of susceptible varieties. In one field of Stringless Green Refugee, practically 100 percent infection was observed resulting in heavy yield reduction. In several trial ground plantings, very high percentages of infection by this virus were noted in varieties such as Tennessee Green Pod, Sulfur, Dixie White, and others.

Yellow bean mosaic, as in 1946, was extremely widespread in small acreages, but in the larger ones it was primarily restricted to the edges of the fields which were in proximity to infected sweetclover growing along ditch banks and fences. In such fields, infected plants were seldom found more than about 100 feet from the boundaries of the field. In smaller plantings, such as trial grounds, 100 percent infection resulted in many cases, causing considerable yield reduction. In most cases, the pole varieties, such as Kentucky Wonder and Blue Lake, showed the greatest amount of infection.

Greasy pod was again found fairly widespread in fields of many snap bean varieties which are susceptible to the common bean mosaic virus. All of those resistant to the latter virus showed no greasy pod.

In the 1946 survey (PDR 31 (2): 59-65) black root was observed on a number of common bean mosaic-resistant varieties and hybrids such as Idaho Refugee, Logan, and Pioneer, which derive their resistance from Corbett Refugee, Kentucky Wonder, and such Creaseback types as Blue Lake, Potomac, and others. During the past season black root was again observed on varieties and hybrids with the same parentage. In addition to the previously reported varieties and hybrids, black root was found on Medal Refugee, Sensation Refugee, U.S.D.A. No. 1 (a new variety not yet named), and 13 hybrids, all having their resistance to common bean mosaic derived from Corbett Refugee. One common bean mosaic-resistant hybrid with Great Northern U.I. No. 1 parentage was resistant to black root. Black root was not observed in the field on any of the common bean mosaic-resistant Great Northerns, Red Mexicans, and Pinto varieties. All of these derive their resistance from Great Northern U.I. No. 1.

The above observations confirm several years' data, soon to be published by the present authors, which show the identity of the virus causing greasy pod and black root symptoms, respectively, on different groups of varieties. Black root virus symptoms are produced on varieties whose resistance to common bean mosaic is derived from Corbett Refugee, Kentucky Wonder, and Creaseback types, when inoculated with greasy pod virus. No black root symptoms develop on varieties deriving their resistance to common bean mosaic from Great Northern U.I. No. 1 and Robust, when they are inoculated with the greasy pod virus. Varieties susceptible to common bean mosaic developed only greasy pod symptoms as previously reported.

Although 100 percent black root infection, accompanied by killing of the plants, was noted in a number of experimental plantings, only a trace of such infected plants has been observed in commercial plantings of varieties resistant to common bean mosaic. This has been true even in years when greasy pod has been very prevalent on varieties susceptible to common bean mosaic.

The variant strain of common bean mosaic, first reported by Richards and Burkholder in New York in 1943 and later by Dean and Hungerford in Idaho in 1946, was observed to be quite widespread in some fields of Great Northern U.I. 15 and Red Mexican 3 and 34. In one field of the latter variety, practically 100 percent of the plants were infected. As reported earlier (PDR 30 (4): 97-105) the symptoms produced by this virus on the above varieties, as well as on dry bean varieties susceptible to the common bean mosaic, are difficult to differentiate from those produced by common bean mosaic. The prevalence of this virus appears to be on the increase. It is of extreme importance since it is infectious to several of the popular dry bean varieties resistant to common bean mosaic and curly-top.

Curly-top was more widespread and caused more damage during the past season than it had for several years. It was found in practically all fields of the susceptible snap bean varieties, varying from a small to a large amount of infection. In one field practically 100 percent infection was noted. Although no varieties are immune, a difference in varietal susceptibility was observed in experimental plantings. The reaction of a number of varieties is listed below:

Very Susceptible	Moderately Susceptible	Slightly Susceptible
Bountiful	Lows Champion	Full Measure
Dixie Belle	Medal Refugee	Giant Stringless Green Pod
Dwarf Horticultural	Plentiful	Idaho Refugee
Florida Belle	Rival	Landreths Stringless Green Pod
Improved Kidney Wax	Tennessee Green Pod	Pencil Pod Black Wax
Logan		Ranger
Longreen		Red Valentine
		Streamliner
		Sure Crop Wax
		Tenderlong
		Top Notch Golden Wax
		U.S. 5 Refugee

In the vicinity of Nampa and Caldwell in Canyon County, practically all of the bean acreage is devoted to the Henderson Bush lima bean varieties. No diseases were observed in any of the plantings surveyed.

In several fields of Red Mexican 34 a small amount of the variant strain of common bean mosaic was noted.

Washington

Observations were made in the vicinity of Pro ssor in Benton County and Puyallup in Pierce County. The bean acreage in these counties is relatively small.

The area around Prossor is a very new bean-growing territory and only small acreages of dry and lima bean varieties are now grown. In the vicinity of Puyallup, the Blue Lake variety is the principal one grown and is used for commercial processing.

Benton County

Bacterial Blights. Neither common nor halo blight was observed and it is doubtful whether these diseases will ever be a factor in production because the environmental conditions of low rainfall and high temperatures hinder the development and spread of these organisms.

Bacterial Wilt. In an experimental bean planting on the Roza Project, only one plant infected with wilt was observed.

Rust and Anthracnose and White Mold. These diseases were not observed.

Viruses. Common bean mosaic was not observed since all of the varieties planted in this area are resistant to the virus.

The variant strain of common bean mosaic reported in Idaho was quite widespread in a commercial planting of Red Mexican U.I. 34 and traces were observed in experimental plantings of Great Northern U.I. No. 15 and in Pinto U.I. Nos. 72, 78, and 111.

Curly top was noted in trace amounts in experimental plantings of Great Northern U.I. Nos. 59, 81, and 123. It is believed that this disease can become a very serious one because of the large populations of leafhoppers that are found on the wild hosts in the desert areas surrounding this area.

No diseases were found in commercial acreages of Fordhook lima beans that were inspected.

Pierce County

Gray Mold (Botrytis cinerea). In an experimental planting of Idaho Refugee beans on the grounds of the Western Washington Experiment Station, this disease was quite widespread and was causing considerable pod rotting and stem decay. It was reported that this disease was the limiting factor in bush bean production, especially in those varieties having an indeterminate growth habit. A trace of the disease was also found on leaves in several commercial Blue Lake plantings.

Viruses. The necrotic strain of yellow bean mosaic, as reported by McWhorter and Boyle, was observed in small amounts in most commercial Blue Lake fields. In one instance more of this disease was observed than in the other fields. This field was in close proximity to a large planting of gladioli which was severely infected with the virus. Considerable aphid colonization was noted on the bean plants and unquestionably the virus was transmitted by aphids from infected gladioli to beans.

A trace of black root was observed in several fields of Blue Lake.

Oregon

Observations were made in the vicinity of Hermiston in Umatilla County where the U.S.D.A. operates a large experimental trial ground. There is no commercial bean acreage in this area. Field examinations were also made in experimental plantings near Corvallis in Benton County, and in commercial acreages of Blue Lake near Eugene in Lane County, and Salem in Marion County.

Umatilla County

Bacterial Diseases. None was observed.

Rust, Anthracnose, and White Mold. These diseases were not observed.

Viruses. Yellow bean mosaic was widespread in the pole varieties and hybrids. The typical yellow mottling and the necrotic strains were observed.

Black root was noted in a small percentage of plants of Blue Lake and hybrids with Blue Lake parentage.

Curly top was very severe on the susceptible garden varieties. Very susceptible varieties, such as Bountiful, showed 100 percent infection.

The disease is so widespread and severe in this area every year that susceptible varieties cannot be grown.

Benton County

Bacterial Diseases. Common and halo blights were severe on several snap bean varieties of local seed origin. On a number of lima bean varieties, Pseudomonas viridifaciens was noted.

Anthracnose. This disease was not observed.

Bean Wilt. A trace of this disease was found in one of the Refugee varieties.

Virus Diseases. Common bean mosaic was observed in several varieties.

Yellow bean mosaic was not widespread.

Greasy pod was very serious in a large number of mosaic-susceptible varieties, such as Tendergreen, Landreths Stringless Green Pod, Plentiful, and others.

Black root was noted in trace amounts on Logan and several hybrids with Corbett Refugee parentage.

Lane and Marion Counties

Bacterial Blights. None was observed.

Anthracnose. This disease was not found.

White Mold. This disease was very serious in many of the Blue Lake fields. In others, smaller amounts of infection were observed. In many of the more seriously infected fields, 4 to 5 tons of beans were picked before they were abandoned, which is about 40 to 50 percent of a normal crop. It appeared that most of the infection resulted from ascospores. In many cases leaf infection started where dead plant parts, such as old blossoms, lodged on a leaf. Here the ascospores germinated and the mycelium proceeded to develop into the growing tissue. Rapid spread was noted, as conditions were ideal for the development of the organism since fields are watered with the overhead system of irrigation. Apothecia were not commonly observed but were found. The disease is increasing in importance and is becoming a very serious factor in production in these counties.

Rust. Bean rust was observed in many fields varying from a trace to severe infection. Where fields were dusted with sulfur, the disease was of minor significance; but where they were abandoned because of serious Sclerotinia infection, rust was very widespread. In one field the aecial stage of the fungus was found abundantly on the leaves of many plants. Aecia have never been found by the writers in the Mountain States.

Viruses. The necrotic strain of yellow bean mosaic was found in a number of fields of Blue Lake but it was not widespread. The infection in some of the fields could be traced to mosaic-infected gladiolus plantings in close proximity.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
BELTSVILLE, MARYLAND.

A SURVEY OF THE INCIDENCE OF THE INTERNAL CORK DISEASE OF SWEETPOTATO IN NORTH CAROLINA

D. E. Ellis[1]

The internal cork disease of sweetpotato, first observed by Nusbaum in South Carolina in 1944[2,3,4,5], was found in North Carolina in August, 1946. In an old plant bed at the McCullers Branch Experiment Station near Raleigh, incidence of the disease ranged from 1 to 10 percent in 1945 stock of the varieties Nancy Gold, Queen Mary, and Ranger. Later, in September 1946, the disease was found in 1945 Porto Rico stock near Laurinburg and at the Lower Coastal Plains Test Farm, Willard. In a brief field survey, made later in September, the purple ring spot leaf symptom associated with the disease was observed in 34 of 75 plantings and in 20 of 28 counties visited. Subsequently, internal cork was found, at a low incidence, in 1946 stocks of Maryland Golden, Nancy Gold, Porto Rico, L-37, and Queen Mary at McCullers, and in Nancy Gold, Porto Rico, and Ranger at Willard.

During January, February, and March, 1947, all Porto Rico stocks being inspected for certification, together with several additional lots, were sampled and examined. A total of 82 samples, averaging 46 roots per sample, was examined. Internal cork was found in 10 samples from 7 counties in North Carolina and in 2 samples from a shipment of seed stock from Louisiana. In most instances the disease was at a low level, the percentage of roots affected ranging from less than 1 to 6 percent.

Since it is known that the disease can most readily be detected in old roots (footnote 4), a plant bed survey was conducted in 31 of the leading sweetpotato producing counties in June and July 1947. Further information was obtained on the distribution and indicated intensity of the disease, which is summarized below.

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[1]The cooperation of the Department of Horticulture, North Carolina State College, the North Carolina Crop Improvement Association, and the North Carolina Agricultural Extension Service, is gratefully acknowledged.

[2]Nusbaum, C. J. A preliminary report on internal cork, a probable virus disease of sweetpotato. Plant Disease Reporter 29: 677-678. 1945

[3]_____ Internal cork, a new disease of sweet potato of unidentified cause. Phytopathology 36: 18-23. 1946

[4]_____ Studies of internal cork, a probable virus disease of sweet potato. (Abst.) Phytopathology 37: 435. 1947

[5]_____ Internal cork -- new sweet potato disease. Sweet Potato Journal 1 (5): 7-9. March 1947

Plant Bed Survey

Through county agents, arrangements were made with growers (approximately five per county) to save their sweetpotato plant beds after the crop was set until samples could be collected. Methods of sampling and examination were essentially as follows: potatoes were dug with a spading fork and selected at random, the size of samples varying from about 20 to more than 100 roots, depending upon the size and number of plant beds at each location. The samples were examined in the plant pathology laboratories at Raleigh, where each root was cut transversely into slices approximately one-eighth inch thick, and examined for symptome of the disease. Affected roots were graded into three classes, "slight," "moderate," and "severe," depending upon the size and number of "corky" spots present.

Approximately 90 percent of all samples were Porto Rico strains. A few samples each of Triumph, Nancy Hall, and Maryland Golden were also collected and are included in the following summary. The incidence of internal cork by counties, samples, and individual sweetpotato roots is shown in Table 1.

Table 1. Summary of incidence of sweetpotato internal cork in North Carolina by counties, samples, and individual roots.

Category	Total surveyed	Internal cork found in		Classification of affected samples					
				Slight		Moderate		Severe	
	No.	No.	%	No.	%	No.	%	No.	%
Counties	31	26	84	--	--	--	--	--	--
Samples	176	65	37	33	50	28	43	5	7
Individual roots	7858	343	4	199	58	131	38	13	4

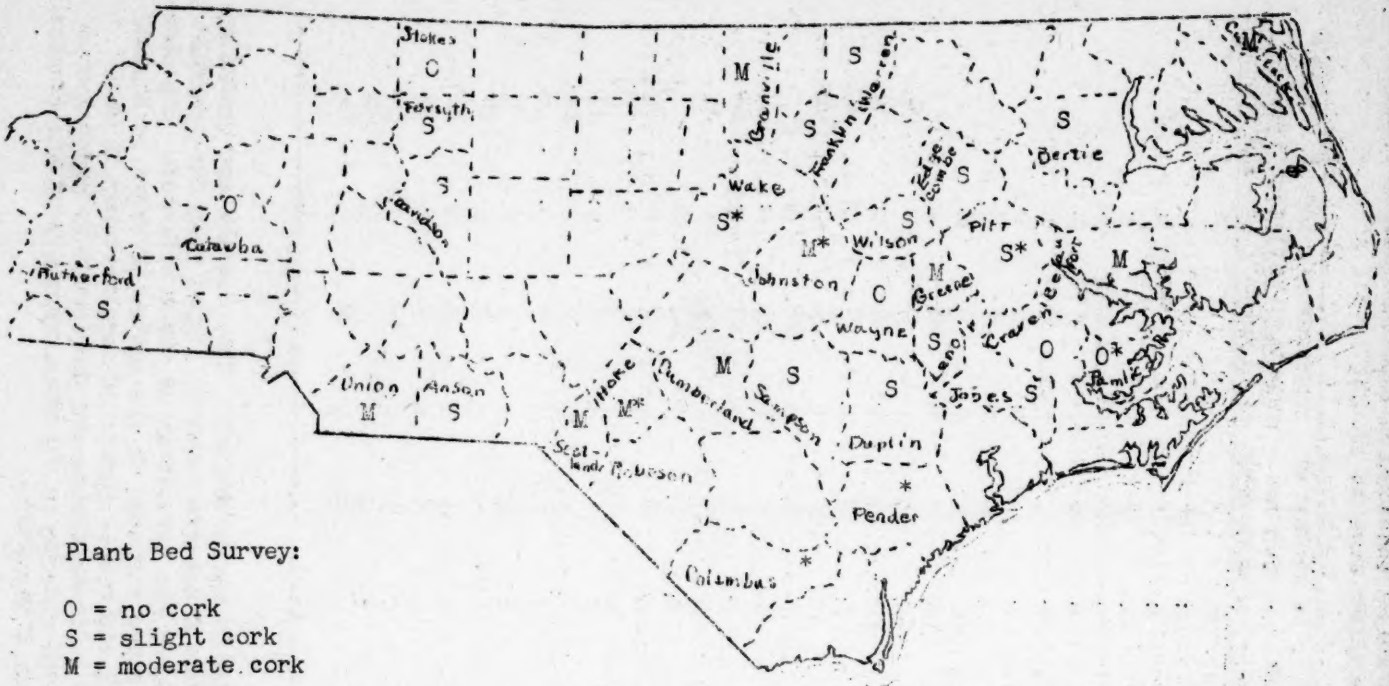
The figures below show the incidence of the disease in affected samples, based on the percentage of infected roots.

Incidence of Cork (Percentage of roots affected)	Samples with Cork	
	Number	Percent
1 to 5	31	48
5 to 10	12	18
11 to 15	9	14
16 to 20	3	4
21 to 30	5	8
31 to 40	3	4
Above 40	2	3

Table 2. Summary of survey of incidence of internal cork of sweetpotato in 31 North Carolina counties in 1947

County	Total number of samples	Number of samples with cork	Percentage range of "corky" roots in affected samples	
			Lowest	Highest
Catawba	10	0		
Craven	5	0		
Pamlico	3	0		
Stokes	5	0		
Wayne	6	0		
Duplin	5	1	2	
Warren	6	1	5	
Jones	5	1	3	
Pitt	6	1	7	
Sampson	7	1	10	
Rutherford	9	2	2	15
Lenoir	6	2	2	5
Anson	6	2	3	8
Franklin	5	2	2	4
Wake	6	1	28	
Robeson	6	2	12	14
Wilson	5	2	2	12
Davidson	7	3	5	6
Forsyth	5	1	28	
Bertie	4	2	2	5
Columbus	6	3	3	7
Edgecombe	4	2	8	20
Granville	5	3	2	10
Johnston	5	3	2	10
Greene	6	4	2	5
Currituck	7	5	2	24
Hoke	5	4	4	11
Cumberland	5	4	3	15
Beaufort	4	3	5	50
Union	6	5	3	62
Scotland	6	5	8	39

Summaries by county are given in Table 2. The counties are listed in indicated ascending order of disease severity, based upon the percentage of affected samples and the percentage of roots affected. The distribution of the 31 counties included in the survey is shown in Figure 1. Because of the small and varied number of samples taken in each county, these data only indicate trends and should not be construed as an accurate measure of the absence or relative intensity of the disease in any county or section of the State.



Plant Bed Survey:

O = no cork
S = slight cork
M = moderate cork

Storage House Survey

* = internal cork found

Figure 1. Indicated relative severity of the internal cork disease of sweetpotato in 31 North Carolina counties included in the plant bed survey, June and July, 1947

It was not always possible to obtain accurate information as to sources of seed stocks and the data on this point did not give any very conclusive evidence regarding the possible origin of the disease. However, certain other indicated trends were of interest. Of 28 samples from home-grown seed stocks, which had been maintained since 1941 or longer, only 7 (25 percent) showed cork, while the disease was found in 58 (39 percent) of the remaining 148 samples, most of which were definitely of more recent origin. Furthermore, of 23 samples traced to seed stock or plants purchased locally, in the immediate vicinity, only 3 (13 percent) showed the disease.

On the basis of these surveys it is clearly apparent that the internal cork disease is generally distributed geographically throughout the major sweetpotato producing areas of North Carolina. However, it should be noted that the disease was found in only 65 of the 176 samples collected and that, for the most part, it was evident in affected stocks at a relatively low level. In nearly one-half (31) of the 65 affected samples, internal cork was found in only 5 percent or less of the roots. Thirty-three samples were classified as having "slight cork" only, while only 5 samples were classifed as "severe." This point is even more apparent from the figures on affected roots. Of the 7858 sweetpotatoes examined, only 343 (4.3 percent) showed internal cork, 199 to a "slight" degree, 131 "moderate", and only 13 "severe." These facts make one wonder whether internal cork is a disease of comparatively recent origin, which has spread rapidly and is slowly increasing in severity, or whether it is a disease of long standing and of relatively minor importance. In any case, the results of the survey would seem to preclude any attempt at eradication in this State.

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
RALEIGH

STATUS OF EELGRASS IN THE ANNISQUAM TIDAL RIVER AND MENEMSHA SALTWATER POND IN MASSACHUSETTS DURING THE SUMMER OF 1947

Ralph W. Dexter

During August of 1947 observations were continued on the status of eelgrass (Zostera marina L.) and its recovery from the epidemic of 1931-32. Field observations were made at Cape Ann, Massachusetts, especially in the tidal inlet known as the Annisquam River. Past conditions of eelgrass in this area have been reported in the Journal of Wildlife Management (8:173-176.1944) and the Plant Disease Reporter (29:702-704.1945; 30:424-425.1946). A visit to Martha's Vineyard during August 19-22 permitted a survey of Menemsha Pond which proved to parallel the situation as found in Goose Cove on the Annisquam River.

A. Annisquam River, at Cape Ann.

As in the past since the epidemic occurred, only Goose Cove had a significant amount of eelgrass, and as in the preceding two years it had increased noticeably in the locality over the previous year. The entire southern half and the entire eastern half of the cove which are not exposed at low tide were occupied by a solid stand of eelgrass in apparent good health, the blades of some plants being as much as four to five feet long. In addition, a continuous margin of eelgrass some 10-20 feet wide stretched along the northern shoreline until it merged with the solid stand in the eastern portion of the cove. Along the roadfill on the western boundary discontinuous patches were found. Only the deeper basin of the northwestern section of the cove adjacent to the cove entrance was free of eelgrass. At the eastern end the growth extended to within approximately 100 feet of the entrance of a fresh-water brook. The stand ended abruptly at that point, with a few small scattered patches extending up to the mouth of the brook. A continuous heap of eelgrass wrack lined the entire shoreline of the cove.

On the western side of the roadfill, which separates most of Goose Cove from the Annisquam River, the connecting channel was about 25 percent covered with eelgrass, which was most abundant near the junction to the cove, and thinned out to small scattered patches in the lower two-thirds of the channel. In nearby Lobster Cove one patch of eelgrass five to six square yards in area and another of a few square feet were found north of the Annisquam Bridge. In Mill River, another branch of the Annisquam inlet, one plant was found just within the junction of this arm of the waterway with the main channel. Miss Ellen Beardslee discovered six rooted, isolated plants on the sand bar at Annisquam at the northern extremity of the inlet. Occasional fragments of eelgrass, mostly spotted in varying degrees, were found floating in the Annisquam River, especially in the vicinity of Goose Cove from which much of it

probably came. Other fragments were discovered on Wingaersheek Beach, Plum Cove Beach, and the shore of Gloucester Harbor. On August 24 a continuous drift line several hundred feet long of fresh, bright green leaves of eelgrass with very few indications of disease spots was found being washed onto the strand at Gloucester Harbor. The seawrack there contained a fair amount of dried eelgrass. One fragment washed in to Plum Cove Beach contained several masses of snail eggs, and at Goose Cove great numbers of the English periwinkle Littorina littorea were attached to the eelgrass. On some floating fragments collected at Wingaersheek Beach were found colonies of Bryozoa and seed of the blue mussel Mytilus edulis. Apparently eelgrass is beginning to resume its former role as a habitat for marine animals. It has not yet, however, returned to the main channel of the Annisquam River in any significant amount.

B. Menemsha Pond, at Gay Head

On August 21 the writer was taken by boat over sections of Menemsha Pond by Mr. Linus Jeffers who had made observations on eelgrass in that body of water while engaged in fishing for quahogs and scallops. In the northwestern section of the pond, in a depth of about five feet at high water, there was a solid stand of eelgrass some four acres in extent. This was the best growth of the plant in Menemsha Pond known to Mr. Jeffers. Scattered patchs varying from one to several square feet in area were found bordering this stand. Many of these patches had a heighth of only one to two feet. Several species of mollusks, especially the gem shell, Gemma gemma, and seed of the scallop Pecten irradians and the blue mussel Mytilus edulis were collected in the root masses of eelgrass while a few specimens of Littorina littorea were found living on the blades of this plant. Occasional floating fragments were collected and along the shoreline a thin wrack of dried eelgrass was found in places. Mr. Jeffers recalled a time before the epidemic when eelgrass choked the marginal waters of the pond to the extent that it was extremely difficult to force a boat through the water. On ocean beaches of Menemsha Bight and along the south shore of Gay Head very few fragments of eelgrass could be found. The situation in Menemsha Pond and vicinity was similar to that observed in Goose Cove and adjoining bodies of water with the exception that the percentage of revegetated area of the much larger Menemsha Pond was not as great as in the smaller Goose Cove.

DEPARTMENT OF BIOLOGY
KENT STATE UNIVERSITY
KENT, OHIO

CHECK LIST REVISION

Freeman Weiss

BELOPERONE (ACANTHACEAE)

BELOPERONE CALIFORNICA Benth., CHUPEROSA. Low shrub of southwestern deserts, sometimes planted for ornament.

Uromyces ruelliae Holw. (0,I,II,III), rust. Ariz., Calif., Nev.

DIANTHERA (ACANTHACEAE)

DIANTHERA AMERICANA L. (1), other spp. (2), WATERWILLOW. Perennial herbs of aquatic or marshy habitats mostly in the South; (1) is a wildlife food plant.

Cercospora diantherae Ell. & Kell., leaf spot. Md. to Kans. and Tex. (1)
Dimerosporiun langloisii Ell. & Martin, on leaves. La., Miss. (2)
Dothideovalsa diantherae (I. M. Lewis) Theiss. & Syd., black knot. Tex. (1)
Phymatotrichum omnivorum (Shear) Dug., root rot. Tex. (1)

DYSCHORISTE (ACANTHACEAE)

DYSCHORISTE OBLONGIFOLIA (Michx.) Kuntze. Perennial herb of pine barrens on the southeastern Coastal Plain, sometimes planted for ornament.

Aecidium tracyanum Syd. (0,I). rust. Fla.

ERANTHEMUM (ACANTHACEAE)

ERANTHEMUM NERVOSUM R. Br. Woody herb of tropical Asia, grown for ornament.

Phyllosticta sp., leaf spot. N. J.

GRAPTOPHYLLUM (ACANTHACEAE)

GRAPTOPHYLLUM PICTUM Griff. Shrub of s. w. Pacific, grown for ornament under glass and in the open in tropical America.

GRAPTOPHYLLUM cont.

Gloeosporium sp., anthracnose. P.R.
Rosellinia bunodes (Berk. & Br.) Sacc. root rot. P.R.

RUELLIA (ACANTHACEAE)

RUELLIA spp. Perennial herbs of open woods and plains as R. CILICOSA Pursh (1) and R. STREPENS L. (2) in the East and South; R. NUDIFLORA (Engelm. & Gray) Urban (3) and R. TUBEROSA L. (4) in the South and westward; other spp. (5). Some are planted for ornament, others furnish food for wildlife.

Cercospora consociata Wint., leaf spot. Ala., Ill., Miss., Mo. (1); Iowa (5).
Phymatotrichum omnivorum (Shear) Dug., root rot. Tex. (5).
Puccinia ruelliae (Berk. & Br.) Lagh. (0,I,II,III), rust. Md. to Fla., Tex. and Kans. (1,2); Tex. (3,4,5); Mo. (5).
Uromyces ruelliae Holw. (0,I,II,III), rust. Tex. (5).

SANCHEZIA (ACANTHACEAE)

SANCHEZIA NOBILIS Hook. f. South American shrub, grown for ornament in the far South.

Clitocybe tabescens (Scop. ex Fr.), mushroom root rot. Fla.

THUNBERGIA (ACANTHACEAE)

THUNBERGIA FRAGRANS Roxb. (1), T. GRANDIFLORA Roxb. (2), T. LAURIFOLIA Lindl. (3). Ornamental woody vines of India, grown for ornament and ground cover in the open in Fla., also in greenhouses.

Agrobacterium tumefaciens (E.F.Sm. & Town.) Conn., crown gall. Fla. (2,3).
Heterodera marioni (Cornu) Goodey, root knot. Fla. (1,2,3)

ADOXA (ADOXACEAE)

ADOXA MOSCHATELLINA L., musk-root. Perennial herb of northern and alpine regions, also grown in rock gardens.

Phyllosticta adoxae Clements, leaf spot. Colo.
Puccinia adoxae Hedw. f. (III), rust. Colo., Utah, Wyo.

ADOXA cont.

P. argentata (Schultz) Wint. (O,I), rust. Iowa, Minn., Wis. II and III on Impatiens spp.
Synchytrium anomalum Schroet., leaf gall. Iowa.

MESEMBRYANTHEMUM (AIZOACEAE)

MESEMBRYANTHEMUM spp., FIG-MARIGOLD. A large and complex group of succulents mostly of S. Africa, some of which are grown under glass as pot plants and in the open in California. The numerous spp. originally assigned to this genus have been distributed among many generic segregates but are here retained under the general name.

Camarosporium ellipticum Cke. & Harkn., on stems. Calif.
Gibberella saubinetii (Mont.) Sacc., on stems. Calif.
Heterodera marioni (Cornu) Goodey, root knot. Ala., Tex.

MOLLUGO (AIZOACEAE)

MOLLUGO VERTICILLATA L., CARPETWEED. Annual of tropical America widely distributed as a weed in cultivated ground; a wildlife food plant.

Ditylenchus dipsaci (Kuehn) Filip., stem nematode. N. Y.
Cercospora molluginicola Lieneman, leaf spot. Wis.
C. molluginis Hals. N. J., Wis.
Phyllosticta molluginis Ell. & Hals., leaf spot. N. J.

SESUVIUM (AIZOACEAE).

SESUVIUM PORTULACASTRUM L. (1) and S. MARITIMUM (Walt.) B. S. P. (2). Fleshy annuals of saline soils on seacoasts and river beaches, sometimes grown in collections of succulents.

Heterodera marioni (Cornu) Goodey, root knot. Fla. (1), Ala. (2).
Puccinia aristidae Tracy, (O,I), rust. Tex. (1) II and III grasses.

TETRAGONIA (AIZOACEAE)

TETRAGONIA EXPANSA Thunb., NEW ZEALAND SPINACH. Fleshy annual grown as a green vegetable and for stock food; locally naturalized in California.

TETRAGONIA cont.

Cercospora sp. (? C. tetragoniae (Speg.) Jacz.), leaf spot. Ind., Mass.
Helminthosporium sp., leaf spot. Tex.
Heterodera marioni (Cornu) Goodey, root knot. Tex.

Curly top - virus (Chlorogenus eutetticola Holmes, Beta virus 1 K. M. Sm.) Calif.
Mosaic - unidentified virus. Del.
Rosette - unidentified virus. Ind.
Yellows - virus (Chlorogenus callistephi Holmes, Callistephus virus 1 K. M. Sm.). N. J., N. Y.

TRIANTHEMA (AIZOACEAE)

TRIANTHEMA PORTULACASTRUM L., HORSE-PURSLANE. Fleshy annual of tropical America, a weed in cultivated ground in the Southwest.

Albugo trianthemae G. W. Wils., white rust. New Mexico.

ALISMA (ALISMACEAE)

ALISMA PLANTAGO-AQUATICA L., WATER-PLANTAIN (1), and similar spp. as A. GEYERI Torr. (2) and A. SUBCORDATUM Raf. (3). Perennial herbs of shallow water and marshes, (1) ranging throughout and (2) locally in the Northeastern and North Central States to the Pacific Coast, (3) in the Central and Western States; important food plants for wildlife.

Cercospora alismatis Ell. & Holw., leaf spot. Del., Iowa, N. Y., N. Dak., Wis.
Cladochytrium maculare (Wallr.) J. J. Davis (Physoderma m. Wallr.), leaf gall. N. Y., Wis. (1) Mont. (sp.)
Didymaria alismatis (Oud.) J. J. Davis, leaf spot. Mont., N. Y., N. Dak., Wash., Wis. (1); N. Y., Iowa (3)
Doassansia alismatis (Nees) Cornu, leaf smut, yellow spot. N. Y. to Mo. and N. Dak.; Calif., Wash. (1); Utah (2)
(Ramularia alismatis Fautr.): Didymaria alismatis

ECHINODORUS (ALISMACEAE)

ECHINODORUS CORDIFOLIUS (L.) Griseb. (1), and E. RADICANS (Nutt.) Engelm. (2), BURHEAD. Low herbs of marshes in the South-

ECHINODORUS cont.

eastern and South Central States; wildlife food plants.

Burrillia echinodori Clint., leaf smut. Calif., Tex., P. R. (1).
Cercospora sp., leaf spot. Tex. (2)
? Doassansia alismatis (Nees) Cornu, leaf smut. Fla. (1)

LOPHOTOCARPUS (ALISMACEAE)

LOPHOTOCARPUS CALYCINUS (Engelm.) J. G. Smith. Aquatic herb of the Central and Eastern States southward, a wildlife food plant.

Doassansia sagittariae (West.) Fisch, leaf smut. Wis.

SAGITTARIA (ALISMACEAE)

SAGITTARIA LATIFOLIA Willd., ARROWHEAD (1), also S. CUNEATA Sheldon (2), S. RIGIDA Pursh (3), and other spp. (4). Perennial herbs of marshes and shallow water, (1) ranging nearly throughout the U. S., (2) and (3) in the Eastern and Central States, occasionally south and west; important food plants of wildlife.

Burrillia pustulata Setch., leaf smut. Ill., Nebr., Wis. (1)
Cercospora alismatis Ell. & Holw. (C. sagittariae Ell. & Kell.), leaf spot. Vt. to Ala., Tex., and Wis. (1); Wis. (3) Tex., P. R. (4)
Didymaria alismatis (Oud.) J. J. Davis, leaf spot. Wis. (3)
Doassansia deformans Setch., smut gall. Mass. to N. J., Mo. and S. Dak. (1); Fla., Tex. (4)
D. furva J. J. Davis, leaf smut. Wis. (3)
D. intermedia Setch., leaf smut. Iowa, Minn., N. H., N. Dak., Wis. (1)
D. obscura Setch., leaf smut. Conn., Mass. (1)
D. opaca Setch., leaf smut, blister. Mass. to Del., Ill., and Wis. (1)
D. sagittariae (West.) Fisch., leaf smut, blister. Conn. to Kans., and Mont. (1); Ind., Wis. (3); Ark., Del., Ill., Mo., Vt., Wis., Wyo. (4). Var. confluens J. J. Davis, Wis. (3).
Gloeosporium confluens Ell. & Dearn., leaf spot. Iowa, Mass., Wis. (1)

ACNIDA (AMARANTHACEAE)

ACNIDA spp., WATER-HEMP, as A. CANNABINA L. (1) in salt marshes of the

ACNIDA cont.

Atlantic Coast, A. TAMARISCINA (Nutt.) Wood (2) and A. TUBERCULATA Moq. (3) in fresh water marshes of the Mississippi Valley; wildlife food plants.

Albugo bliti (Biv.-Bern.) Kuntze, white rust. Iowa, Mich. (2); Iowa, Kans., Wis. (3)
Cercospora acnidae Ell. & Ev., leaf spot. Del. (1), Wis. (3)
Phyllosticta amaranthi Ell. & Kell., leaf spot. N. Y. (3)
Phymatotrichum omnivorum (Shear) Dug., root rot. Tex. (2)

ALTERNANTHERA (AMARANTHACEAE)

ALTERNANTHERA BETTZICKIANA (Regel) Standl., GARDEN ALTERNANTHERA (1); A. PHYLLOXEROIDES (Mart.) Griseb., ALLIGATOR WEED (2); other spp. (3). Perennial herbs of tropical America. Many forms of (1) and some other spp. are grown for ornamental foliage; (2) is a weed in cultivated fields but furnishes food for wildlife.

Albugo bliti (Biv.-Bern.) Kuntze, white rust. Canal Zone (3)
Cercospora alternantherae Ell.& Langl., leaf spot. La., P. R. (3)
Fusarium oxysporum Schlecht., root rot, wilt. N. J. (1)
Guignardia cephalariae (Auers.) F. L. Stevens var. alternantherae (Sacc.) F. L. Stevens, on leaves. P. R. (3)
Heterodera marioni (Cornu) Goodey, root knot. La. (2), Fla. (3)
Phyllosticta amaranthi Ell. & Ev., leaf spot. N. J.
Rhizoctonia solani Kuehn, root rot. Ill., N. J. (1); La. (2)
Uredo maculans Pat.& Gaill. (II), rust. Canal Zone (3)

AMARANTHUS (AMARANTHACEAE)

AMARANTHUS spp. (cultivated) as A. CANDATUS L., LOVE-LIES BLEEDING (1); A. HYBRIDUS L., especially var. HYPOCHONDRIACUS (L.) Bailey, PRINCES-FEATHER (2); and A. TRICOLOR L., JOSEPHS-COAT (3), including A. GANGETICUS L., TAMPALA. Annual herbs of tropical Asia, (1) and (2) grown for ornament (3) also for greens; the primitive form of (2) is widely distributed as a weed and furnishes food for wildlife

Albugo bliti (Biv.-Bern.) Kuntze, white rust. Mass. to Fla., Tex., Nebr. (2)
Heterodera marioni (Cornu) Goodey, root knot. Fla., Md. (1), Fla. (2,3).
Phoma amaranti Hals (? P. longissima), on stems. N. J. (2)
Pythium debaryanum Hesse, damping off. Conn. (1)

AMARANTHUS cont.

Curly top - virus (Chlorogenus eutetticola Holmes, Beta virus 1 K. M. Sm.). Calif. (1), Tex. (1,3)
Yellows - virus (Chlorogenus callistephi Holmes, Callistephus virus 1 K. M. Sm.). N. Y. (1), Md. (3)

AMARANTHUS spp. (weeds), as A. BLITOIDES S. Wats., PROSTRATE AMARANTH (1); A. GRAECIZANS L., TUMBLEWEED (2); A. RETROFLEXUS L., ROUGH PIGWEED (3); A. SPINOSUS L., SPINY AMARANTH (4). Annuals, naturalized respectively from the western U. S., Europe, and tropical America; now cosmopolitan weeds but furnishing food for wildlife.

Albugo bliti (Biv. - Bern) Kuntze, white rust. General (1,2,3,4).
Alternaria amaranthi (Pk.) Van Hook (? A. solani (Ell. & Martin) Sor.), leaf spot. Ind., Kans., N. Y. (3); Utah, Wash. (sp.)
Aphanomyces cochlioides Drechs., root rot. Iowa (3)
Aphelenchoides fragariae (Ritz-Bos) Christie, in roots. Ark. (3)
Cercospora brachiata Ell. & Ev., leaf spot. Del., Fla. (3), Tex. (4); P. R. (sp.)
Corticium microsclerotia Weber. See Rhizoctonia.
Gloeosporium amaranthicola Dearn., anthracnose. Wis. (3), N. Car. (sp.)
Heterodera marioni (Cornu) Goodey, root knot. Fla. (2,3), Ala. (3), Ala., Fla., Tex. (4)
H. schachtii A. Schm., root nematode. Utah (3)
Peronspora amaranthi Gäumaun, downy mildew. N. J., N. Y. (sp.)
Phoma amarinthicola Brun., on stems and inflorescence. Ore. (2)
P. longissima (Pers. ex. Fr.) West., on stems. Ohio (sp.)
Phyllosticta amaranthi Ell. & Kell., leaf spot. Ala., Kans., Ky., Miss., N. J., Tex. (3)
Phymatotrichum omnivorum (Shear) Dug., root rot. Tex. (3,4,sp.)
Pratylenchus pratensis (De Man) Filip., meadow nematode (3)
Puccinia aristidae Tracy (0,I), rust. Colo. (1,2,3)
Ramularia sp., leaf spot. Iowa (3)
Rhizoctonia solani Kuehn, root rot. Ill. (1), Wash. (1,2,3)
Sterile stage of Pellicularia filamentosa (Pat.) Rogers. R. (Corticium) microsclerotia, reported on (3) in Fla., is perhaps a synonym.
Sclerotinia sclerotiorum (Lib.) DBy., stem rot. Mont. (3)
Sclerotium rolfsii Sacc. (Pellicularia rolfsii (Curzi) E. West), stem rot. Fla. (3,4), La. (3).

Curly top - virus (Chlorogenus eutetticola Holmes, Beta virus 1 K. M. Sm.). Calif. (2), Ore., Tex. (3)
Mosaic - unidentified virus. Kans., Tex. Susceptibility to systemic infection by cucumber mosaic virus has been demonstrated.

AMARANTHUS cont.

Ringspot - unidentified virus. Colo. (3) Susceptibility to infection by tomato ringspot virus is reported.
Yellows - virus (Chlorogenus callistephi Holmes, Callistephus virus 1 K. M. Sm.). Wis. (3)

CELOSIA (AMARANTHACEAE)

CELOSIA ARGENTEA L., especially var. CRISTATA Kuntze, COCKSCOMB. Weedy annual of tropical Asia, horticultural forms of which are grown for ornament.

Alternaria sp., leaf spot. N. J.
Cercospora celosiae Syd., leaf spot. Ala., Okla.
Heterodera marioni (Cornu) Goodey, root knot. Kans., Ohio, Tex.
Phyllosticta sp., leaf spot. N. J.
Rhizoctonia solani Kuehn, damping off. Conn.
Sclerotium bataticola Taub., charcoal rot. Tex.

Curly top - virus (Chlorogenus eutetticola Holmes, Beta virus 1 K. M. Sm.). Calif., Tex.

FROELICHIA (AMARANTHACEAE)

FROELICHIA spp. Annual or perennial herbs of dry plains; of minor forage value or may be grown for ornament.

Albugo froelichiae G. W. Wils., white rust. Nebr., Tex.
Cercospora crassoides J. J. Davis, leaf spot. Wis.
Heterodera marioni (Cornu) Goodey, root knot. Fla.

GOMPHRENA (AMARANTHACEAE)

GOMPHRENA GLOBOSA L., GLOBE-AMARANTH (1). Annual of Old World tropics grown for ornament. Other spp. are native to the Southwestern States, and are of minor forage value.

Albugo bliti (Biv. - Bern.) Kuntze, white rust. N. Mex. (2)
Alternaria sp., leaf spot. P. R. (1)
Cercospora gomphrenae Ray, leaf spot. Okla., ? Ga., Tex.
Heterodera marioni (Cornu) Goodey, root knot. Fla. (1)

Curly top - virus (Chlorogenus eutetticola Holmes, Beta virus 1 K. M. Sm.). Tex. (1,2)

IRESINE (AMARANTHACEAE)

IRESINE spp., BLOOD-LEAF, especially I. HERBSTII Hook. f. (1) and I.LINDENII Lem.(2); South American herbs grown for colored foliage. I. CELOSIA L. (3) and other spp. (4) are sometimes grown for ornament, or are weeds.

Cercospora gilbertii Speg., leaf spot. P. R. (3)
Heterodera marioni (Cornu) Goodey, root knot. Md. (1,2), ? Fla. (3)
Puccinia striolata (Speg.) Arth. (II,III), rust. P. R., Virgin Is. (4).
Raghnildiana gonatoclada (Syd.) Solheim & F. L. Stevens, leaf spot. P. R. (3,4)
Rhizoctonia crocorum (Pers.) DC. ex Fr., root rot. Tex. (4)
R. solani Kuehn, root rot. Ill. (1)
Thecaphora iresine (J. A. Elliott) Jacks., inflorescence smut. Ind. (3)
Uromyces iresines Lagh. (I,III), rust. Virgin Is. (4)

AGAVE (LILIACEAE)[1]

AGAVE AMERICANA L., CENTURY PLANT (1); A. SISALANA (Engelm.) Perrine, SISAL HEMP (2); other spp. (3). Robust perennials, mostly of arid, warm regions in Mexico and Central America; some in southern Calif. to N. Mex. (1) is widely grown as a decorative plant; (2) and several others are important fiber plants; various food and utilitarian articles are obtained from other spp. not commercially cultivated in the U. S. but sometimes grown for novelty in the far South, Calif. and Hawaii.

Botrytis cinerea Pers. ex Fr., gray-mold blight. Occasional on (1) following overwatering or chilling.
Collototrichum agaves Cav. See Glomerella cingulata.
Coniothyrium concentricum (Desm.) Sacc. (C. concentricum var. agaves Sacc., C. agaves (Dur. & Mont.) Sacc.), leaf spot (? secondary). Common on (1), occasional on other spp.
Diplodia theobromae (Pat.) Nowell, leaf rot. P. R. (3) Conidial stage of Physalospora rhodina (Berk. & Curt.) Cke.
Dothidella parryi (Farl. ex Cke.) Theiss. & Syd., leaf spot, black patch. P. R. (2), Calif. (3).
Exosporium sp., leaf spot. (Tex. (3).

[1] Sometimes referred to the Amaryllidaceae; inserted here because omitted from the Liliaceae as previously listed. PDR Vol. 31, Nos. 1 and 2.

AGAVE cont.

Gloeosporium agaves Syd. See Glomerella cingulata
Glomerella cingulata (Ston.) Spauld. & Shrenk, anthracnose, black rot. Occasional (1,2,3) following mechanical injury. Reported in the conidial stage as Gloeosporium (Colletotrichum) agaves.
Lembosia agaves Earle, black mildew. P. R. (3)
Melanconium americanum Pk. & G. W. Clint., on leaves. N. Y. (1)
Stagonospora gigantea Heald & Wolf, leaf spot, blight. Tex. (1), N. Mex. (3)

AMARYLLIS (AMARYLLIDACEAE)

AMARYLLIS BELLADONNA L. (Hippeastrum puniceum Urb., H. equestre Herb.), BELLADONNA-LILY (1); AMARYLLIS spp. (mostly derivatives and hybrids of A. reginae L. and A. vittata Herb.), AMARYLLIS (2). Bulbous herbs of tropical America, cultivated for ornament under glass and as house plants, also in the open in the far South and California.

Asterinella hippeastri Ryan, black mildew. P. R. (1)
Botrytis cinerea Pers. ex Fr., gray-mold blight, bulb rot. Occasional (1,2), chiefly in outdoor plantings after chilling.
Cercospora amaryllidis Ell. & Ev., leaf spot. Ala., La., P. R. (2)
Epicoccum purpurascens Ehr., secondary leaf spot. Calif.
Phyllosticta spp. See Stagonospora curtisii
Pythium debaryanum Hesse, seedling root rot. Fla., Tex. (2)
Rhizopus stolonifer (Ehr. ex Fr.) Lind, soft rot of bulbs.
Sclerotium rolfsii Sacc., southern blight, bulb rot. Fla. (1,2)
Stagonospora curtisii (Berk.) Sacc. (S. crini Bub. & Kab.), red blotch, leaf scorch. General, especially on (2), occasionally on (1). Reports of Phyllostica spp. on amaryllis probably refer to this in immature state.

Mosaic - unidentified virus. Calif. (1,2), Fla., Okla., Wis., Hawaii (2)
Spotted wilt - virus (Lethum australiense Holmes, Lycopersicon virus 1 K. M. Sm.). Calif. Tex. (1,2)

COOPERIA (AMARYLLIDACEAE)

COOPERIA spp., RAIN-LILY. Bulbous herbs of Tex. and N. Mex., grown for ornament in the Gulf States.
Puccinia cooperiae Long (0,I,II,III), rust. Tex.

CRINUM (AMARYLLIDACEAE)

CRINUM spp., chiefly C. LONGIFOLIUM Thunb., C. ZEYLANICUM L., and related spp. or hybrids (1), and C. AMERICANUM L. (2). Bulbous herbs of tropical Asia or Africa (1), of the Gulf States (2), grown in gardens in the far South or sometimes as houseplants.

Cercospora pancratii Ell. & Ev., leaf spot. Ala., Fla., P. R., Virgin Is. (1), Miss. (2)
Stagonospora curtisii (Berk.) Sacc., red blotch, leaf spot. Calif., N. Y. (1)

Mosaic - unidentified virus. Calif. (1).

EUCHARIS (AMARYLLIDACEAE)

EUCHARIS GRANDIFLORA Planch., AMAZON-LILY. Flowering bulb of the northern Andes, grown under glass or indoors.
Botrytis cinerea Pers. ex Fr., gray-mold blight. Fla.
Stagonospora curtisii (Berk.) Sacc., red blotch. Calif. (1)

Mosaic - unidentified virus. P. R.

FURCRAEA (AMARYLLIDACEAE)

FURCRAEA GIGANTEA Vent., MAURITIUS-HEMP (1) and FURCRAEA spp. (2). Succulent herbs of tropical America, grown there chiefly for ornament but the former is an important fiber plant in some places.

Diplodia agaves Niessl (? D. theobromae (Pat.) Nowell), leaf rot. Canal Zone (2)
Dothidella parryi (Farl. ex. Cke.) Theiss. & Syd., leaf spot. P. R. (1)
Echidnodella fourcroyae Ryan, on leaves. P. R. (2)
Heterodera marioni (Cornu) Goodey, root knot. Md. (1)
Phoma fourcroyae Thuem., on leaves. P. R. (2).

GALANTHUS (AMARYLLIDACEAE)

GALANTHUS spp. (chiefly G. nivalis L.), SNOWDROP. Hardy flowering bulbs of southern Europe and Asia, grown in gardens.

Botrytis galanthina (Berk. & Br.) Sacc. Botrytis blight. Not reported in our range on growing plants but found in the

GALANTHUS cont.

sclerotial stage on imported bulbs.
Sclerotium sp. Occurrence as above but a distinct form.

HIPPEASTRUM See AMARYLLIS

HYMENOCALLIS (AMARYLLIDACEAE)

HYMENOCALLIS CALATHINA Nichols, SPIDER-LILY, BASKET-FLOWER (1); H. CARIBAEA Herb. (2); H. CRASSIFOLIA Herb. (3); other spp. (4).

Bulbous herbs of tropical and semi-tropical America, grown for ornament, especially (1), introduced from the northern Andes region; (2) and (3) are native in the Caribean region and southern U. S. respectively.
Cercospora pancratii Ell. & Ev., leaf spot. P. R. (2,4) Fla., La. (3); Tex., P. R. (4)
Mycosphaerella aggregata Earl, on leaves. P. R. (4)
(Phyllosticta hymenocallidis Seaver): Stagonspora curtisii
Stagonospora curtisii (Berk.) Sacc., leaf spot. Calif. (1), P. R. (2,4), Tex. (4)

Mosaic - unidentified virus. Calif. (3,4)

HYPOXIS (AMARYLLIDACEAE)

HYPOXIS HIRSUTA (L.) Coville, GOLDEN STARGRASS (1). Small herb of dry ground in the Eastern and Central States and southward, a wildlife food plant, sometimes grown in rock gardens.

Cylindrosporium guttatum Wint., leaf spot. Wis.
Septoria hypoxis (hypoxi) Overh., leaf spot. Pa.
Urocystis hypoxys Thaxt., floral smut. Conn., Mass.
Uromyces affinis Wint. (I,III), rust. Mo., ?Conn., ?Miss.
U. necopinus Cummins (I,II,III), rust. N. Y.

LEUCOJUM (AMARYLLIDACEAE)

LEUCOJUM VERNUM L., SNOWFLAKE. Small hardy flowering bulb of Europe, grown in gardens.

Botrytis sp. (? Sclerotinia), on bulb scales. Ore.
Stagonospora curtisii (Berk.) Sacc., leaf spot. Calif.

LYCORIS (AMARYLLIDACEAE)

LYCORIS RADIATA Herb. (1) and L. SQUAMIGERA Maxim. (2) Hardy flowering bulbs of eastern Asia, grown in gardens on (1) as a pot plant.

Aphelenchoides fragariae (Ritz. - Bos.) Christie, in bulbs. N. Car. (1), Va. (2)
Ditylenchus dipsaci (Kuehn) Filip., bulb nematode. N. Car., Va. (1)
Hoplolaimus sp., root nematode. N. Car. (1)
Stagonospora curtisii (Berk.) Sacc., leaf spot. Calif. (2)

NARCISSUS (AMARYLLIDACEAE)

NARCISSUS spp., NARCISSUS, DAFFODIL. Flowering bulbs of western and southern Europe, hardy except (4), widely grown in gardens and as house plants, also in fields and under glass for cut flowers. Most of the records do not discriminate between the various spp., much modified by hybridization and selection, that compose horticultural varieties, but some apply in particular to the following species: N. JONQUILA L., JONQUIL (1); N. POETICUS L., POETS' NARCISSUS (2); N. PSEUDO-NARCISSUS L., TRUMPET DAFFODIL (3); N. TAZETTA L., POLYANTHUS NARCISSUS (4); others (5). Commercial culture of hardy narcissus is carried on chiefly in Wash., Ore., N. Y., Pa., Va., N. Car.; of polyanthus types in Calif., Tex., Fla., and S. Car.

Aphelenchoides fragariae (Ritz. - Bos.) Christie, in bulbs causing scale necroses. Fla., Ga., N. & S. Car. A. subtenuis (Cobb) Steiner & Buhrer, causing a similar disease, is reported in the same range and also the Pacific coast States. A. parietinus (Bast.) Steiner and Aphelenchus avenae Bast. are frequently associated with brown-ring symptoms but are probably secondary.
Armillaria mellea Vahl ex Fr., root and bulb rot. Calif., Ore., Wash.
Aspergillus spp. (commonly A. niger v. Tiegh. and A. flavus Lk. ex. Fr.), black mold, secondary dry rot. Cosmopolitan following nematode or mite injury and primary decays.
Botrytis spp., gray-mold blight, neck rot, dry scale rot. Widely reported, often without specific discrimination, but involving at least two distinct diseases: smolder (sprout necrosis) caused by B. narcissicola Kleb. (see Sclerotinia narcissicola), and fire (leaf blight) caused by B. polyblastis Dowson (Sclerotinia polyblastis) and perhaps B. cinerea Pers. ex Fr., the latter often on fading flowers and leaves.
Cylindrocarpon radicicola Wr., secondary root rot. N. Y., N. Car., Ore., Va., Wash.

NARCISSUS cont.

Ditylenchus dipsaci (Kuehn) Filip., brown-ring disease, leaf "spikkel." Reported at times in all commercial narcissus areas and also other localities throughout the U. S., (1,2,3); Calif., Fla., S. Car., Ore. (4)

Fusarium oxysporum Schlecht. f. narcissi Snyder & Hansen (F. bulbigenum Cke. & Mass.), basal rot. General on hardy varieties; rare, or absent in typical form, on polyanthus varieties. Other forms of F. oxysporum, and especially F. moniliforme Sheldon, also are associated with bulb and root rots but their significance is undetermined.

Gloeosporium sp. (? Glomerella cingulata (Ston.) Spauld. & Shrenk), leaf and stem rot. La., N. Car.

Leptosphaeria sp., on leaves. Wash. (2)

Penicillium spp., blue mold. Occasional as wound rot and in damp storage.

(Phyllosticta narcissi Aderh.): Stagonospora curtisii

Pratylenchus pratensis (De Man) Filip., root nematode. Ohio.

Ramularia vallisumbrosae Cav., white mold, Ramularia blight. Ore., Wash.

Rhizopus spp. (commonly R. stolonifer (Ehr. ex Fr.) Lind, and probably others), soft rot, mushy rot. Cosmopolitan as sequel to sun scald, especially on (2), and other thermal injuries.

Sclerotinia narcissicola Gregory, smolder, neck rot. N. Y., N. Car., Ore., Va., Wash., probably general in northern bulb districts (1,2,3,5). Not reported on (4).

S. polyblastis Gregory, fire, Botrytis blight. Wash.

Sclerotium (Sclerotinia) sp., large scale speck. Md., Mo., N. Y., N. Car., Ore., Va., Wash.; probably general in northern bulb districts (1,2,3). Not reported on (4).

Sclerotium sp. (? S. bataticola Taub.), small scale speck, sometimes neck rot. Calif., Fla., N. Y., N. Car., Ore., Tex., Va.; probably general but especially in southern bulb districts. On all types, commonly on (4).

S. rolfsii Sacc. (including S. delphinii Welch), wet scale rot. Calif., Fla., N. Y., Va. (1,2,3); Fla. (4).

Stagonospora curtisii (Berk.) Sacc., leaf scorch. General especially in eastern and southern bulb districts; on all types.

Trichoderma viride Pers. ex Fr., green mold, secondary scale and root rot. Cosmopolitan, following various injuries and primary decays.

Mosaic (yellow stripe, gray disease) - virus. General, affecting all types, and universal or nearly so in some varieties. Relationship to other viruses not established.

NARCISSUS cont.

White streak - virus. Calif., Md., N. Y., N. Car., Ore., Wash.; probably general. Commonly on (3)

NERINE (AMARYLLIDACEAE)

NERINE SARNIENSIS Herb., GUERNSEY-LILY (1) and Nerine spp. (2). Bulbous herbs of South Africa grown for ornament indoors or in the open in the South.

Stagonospora curtisii (Berk.) Sacc., red blotch. Calif. (1,2)

POLIANTHES (AMARYLLIDACEAE)

POLIANTHES TUBEROSA L., TUBEROSE. Perennial herb of Mexico, grown for summer flowering in gardens mostly in the South, sometimes in greenhouses or as a houseplant in the North.

Cercospora sp., leaf spot. Tex.
Erwinia carotovora (L. R. Jones) Holland, soft rot. N. Car.
Helminthosporium sp., leaf & stem spot. Tex.
Heterodera marioni (Cornu) Goodey, root knot. Fla., N. Car., Tex., Va.
Pythium debaryanum Hesse, root rot. Tex.
Rhizoctonia solani Kuehn, root rot. N. Car.

STERNBERGIA (AMARYLLIDACEAE)

STERNBERGIA LUTEA Roem. & Schult., "FALL-DAFFODIL." Hardy flowering bulb of the Mediterranean region, grown in gardens.

Stagonospora curtisii (Berk.) Sacc., leaf spot. Calif.

VALLOTA (AMARYLLIDACEAE)

VALLOTA SPECIOSA Voss, SCARBOROUGH-LILY. Flowering bulb of South Africa, grown as a pot-plant.

Stagonospora curtisii (Berk.) Sacc., leaf spot. La.

ZEPHYRANTHES (AMARYLLIDACEAE)

ZEPHYRANTHES ATAMASCO Herb., ATAMASCO-LILY (1). Flowering bulb

ZEPHYRANTHES cont.

of moist woodlands in the southeastern and Gulf States, sometimes transplanted to gardens. Z. CANDIDA Herb. (2), and other spp. (3), ZEPHYR-LILY, flowering bulbs of subtropical and tropical America, are also grown in gardens in warm regions.

Colletotrichum liliacearum [Schw.] Ferr., leaf spot. N. Car. (1)

Puccinia cooperiae Long (0,I,II,III), rust. Fla. (1,3), Ala., N. Car. (1). P. zephyranthes Ell. & Ev., a nomen nudum, also has been applied to this.

Sclerotium sp. (? S. bataticola Taub.), scale speck, ? dry rot. Ore. (2)

Stagonospora curtisii (Berk.) Sacc., leaf spot. Calif.

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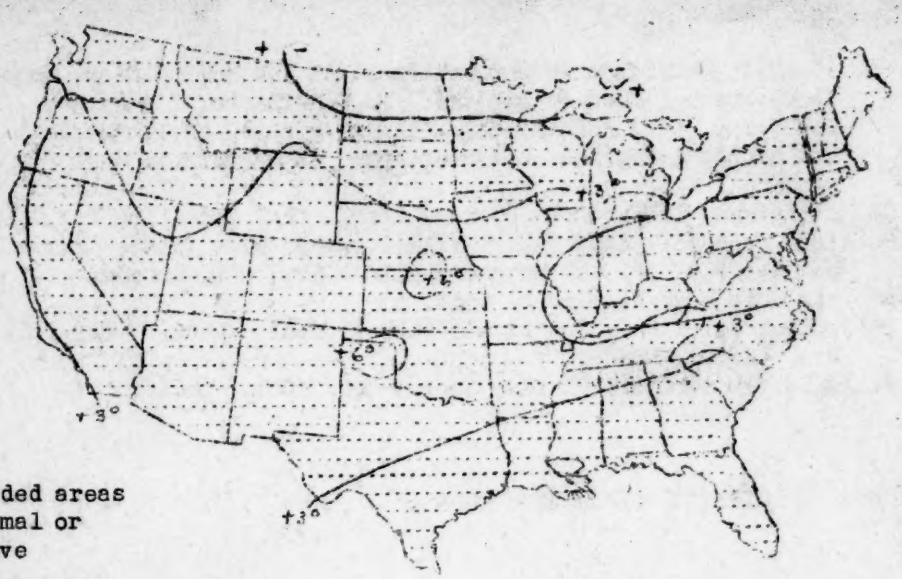
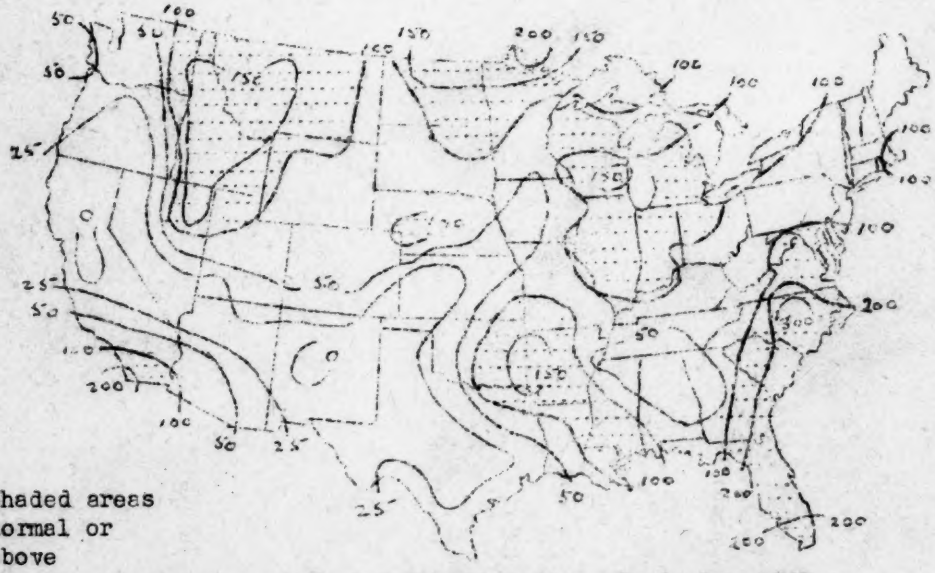


Shaded areas normal or above

Map I. Departure of Mean Temperature from Normal, September 1947



Shaded areas normal or above

Map II. Percentage of Normal Precipitation, September 1947

SEPTEMBER WEATHER

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